

# ELECTROCARDIOGRAM (ECG)

مُقدِّمات

## INTRODUCTION

Waves يسجل على ورقة → ECG is a machine that records electrical activity of the heart

Polarized state  $+++ \rightarrow$  Depolarization  $--- \rightarrow$  Repolarization

### Wave:

إتجاهها

### Direction:

- Upright (+ve)
- Inverted (-ve)

Depend on: site of recording electrode in relation to direction of electricity (i.e. electricity towards or away from electrode)

إتجاه التيار الكهربائي بالنسبة للـ electrode التي يسجل

ارتفاعها

Height (amplitude): quantity of electricity in mV.

Depend on the muscle thickness:

- Thin muscle:  $\downarrow\downarrow$  amplitude
  - Thick muscle:  $\uparrow\uparrow$  amplitude
- This is an indicator of hypertrophy

قوة الكهرباء إلى طلعة الـ Volte

إتساعها

Width: duration of wave in m.sec.

Depend on (conductivity)

- Fast conduction: narrow wave.
- Slow conduction: wide wave.

مُسرعة التوصيل

Wave المدة التي أخذتها الـ

### Papers:

1 big square = 5 small squares

### - Voltage:

10 Small squares = 1 mV

### - Duration:

Small square = 0.04 sec

1 Big squares = 0.2 sec.  $\frac{1}{5}$

1 sec = 5 big squares

1 minute = 300 big squares = 1500 small squares

N.B.: there is a mark on the upper white paper every 5 big squares (i.e. 1 sec.)

### Waves of ECG:

P wave: atrial depolarization

QRS complex: ventricular depolarization

T wave: ventricular repolarization

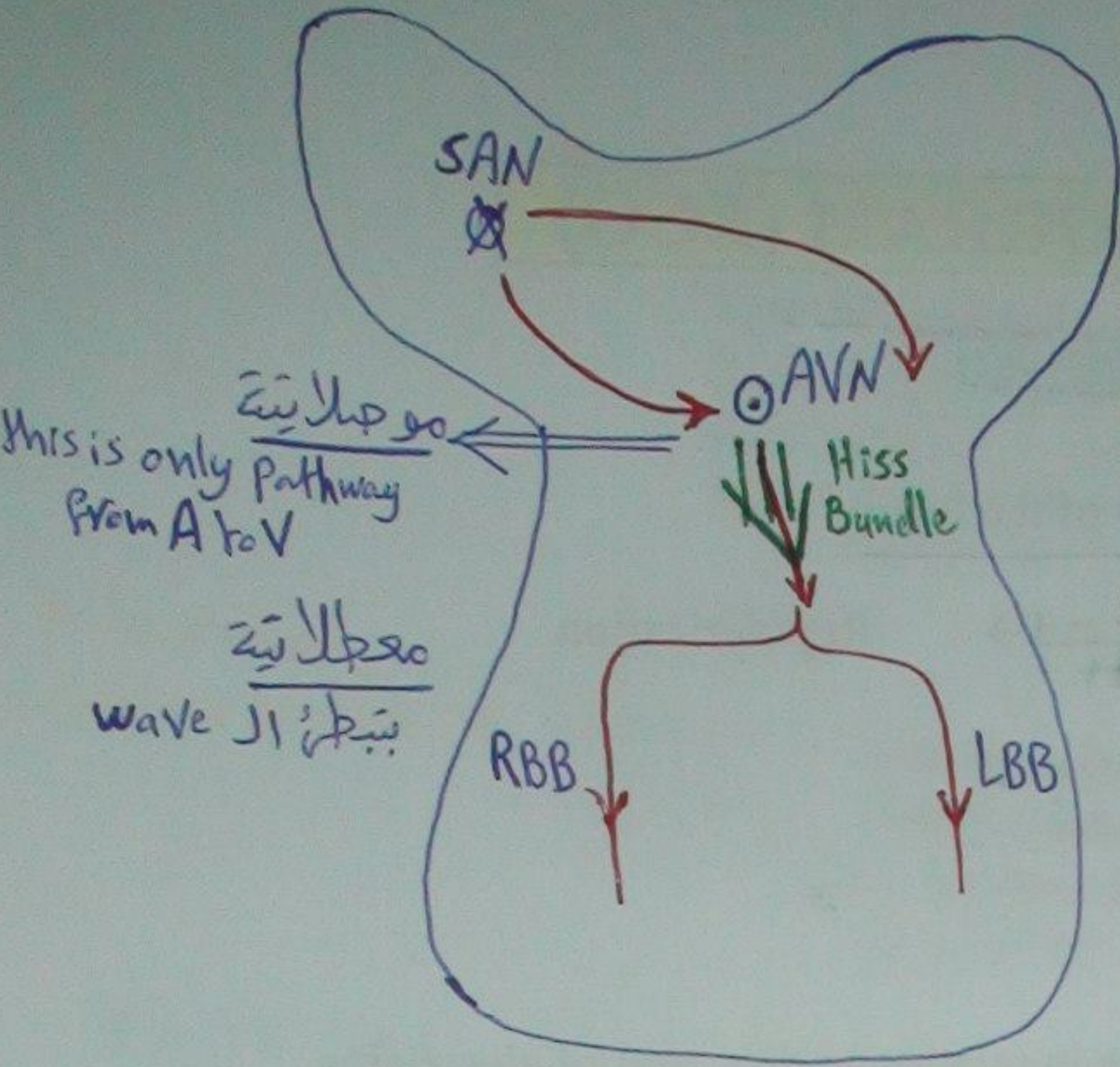
N.B.: repolarization of the atrium is masked by QRS



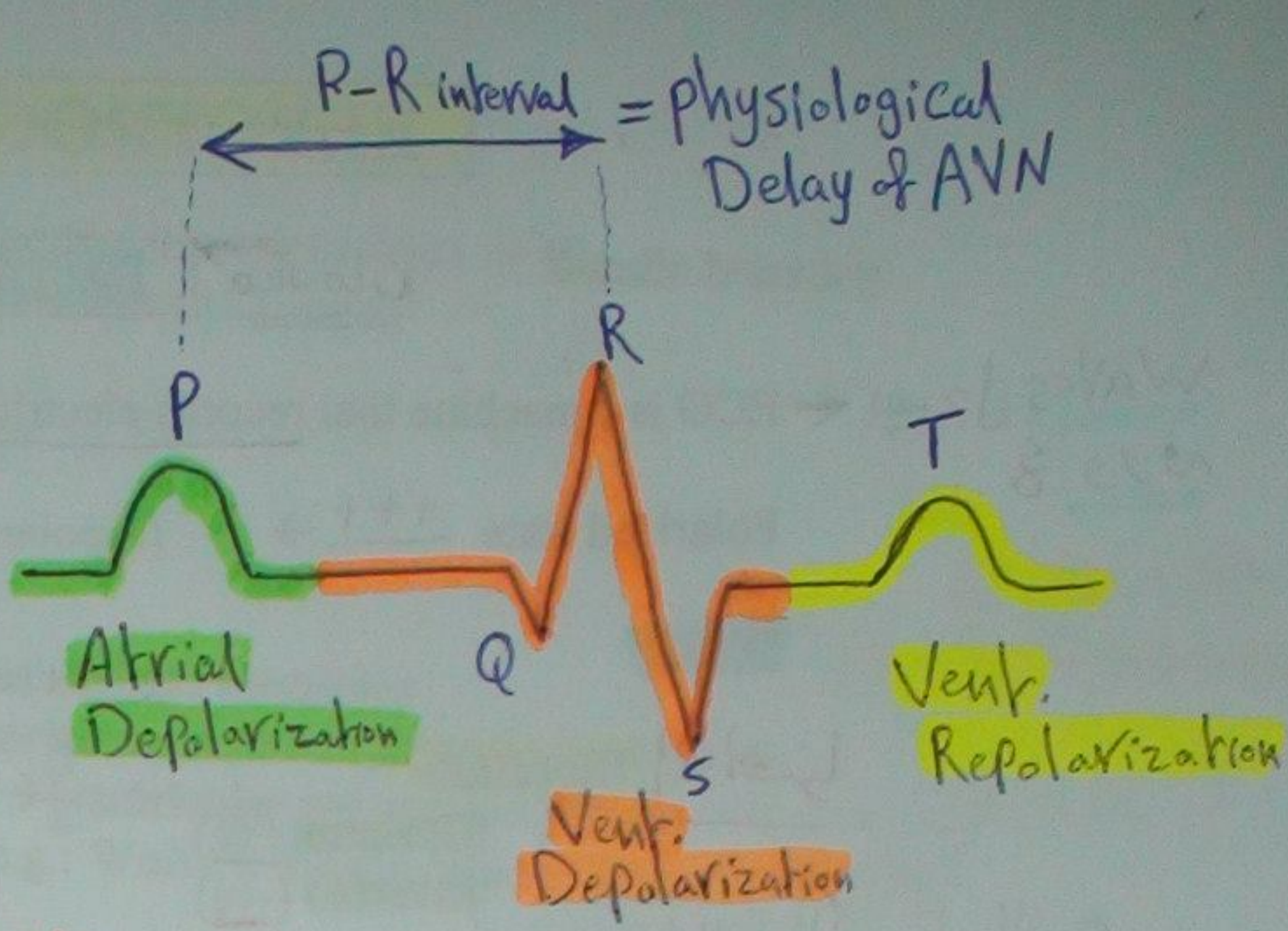
VISIT...

LANZAROTE  
*Caliente*.COM

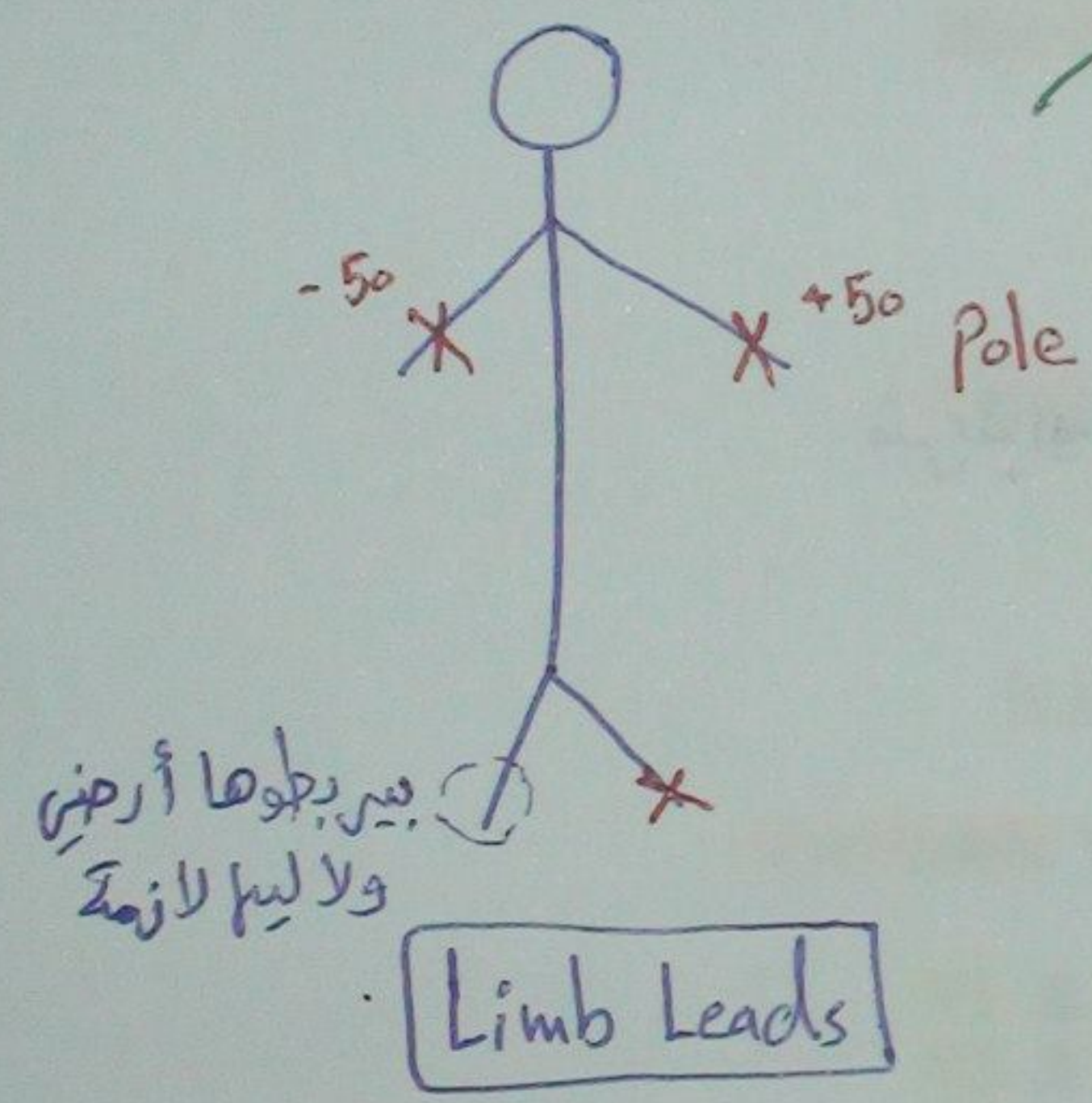




This is only pathway from A to V  
 موجلاية  
 wave بيتر ال

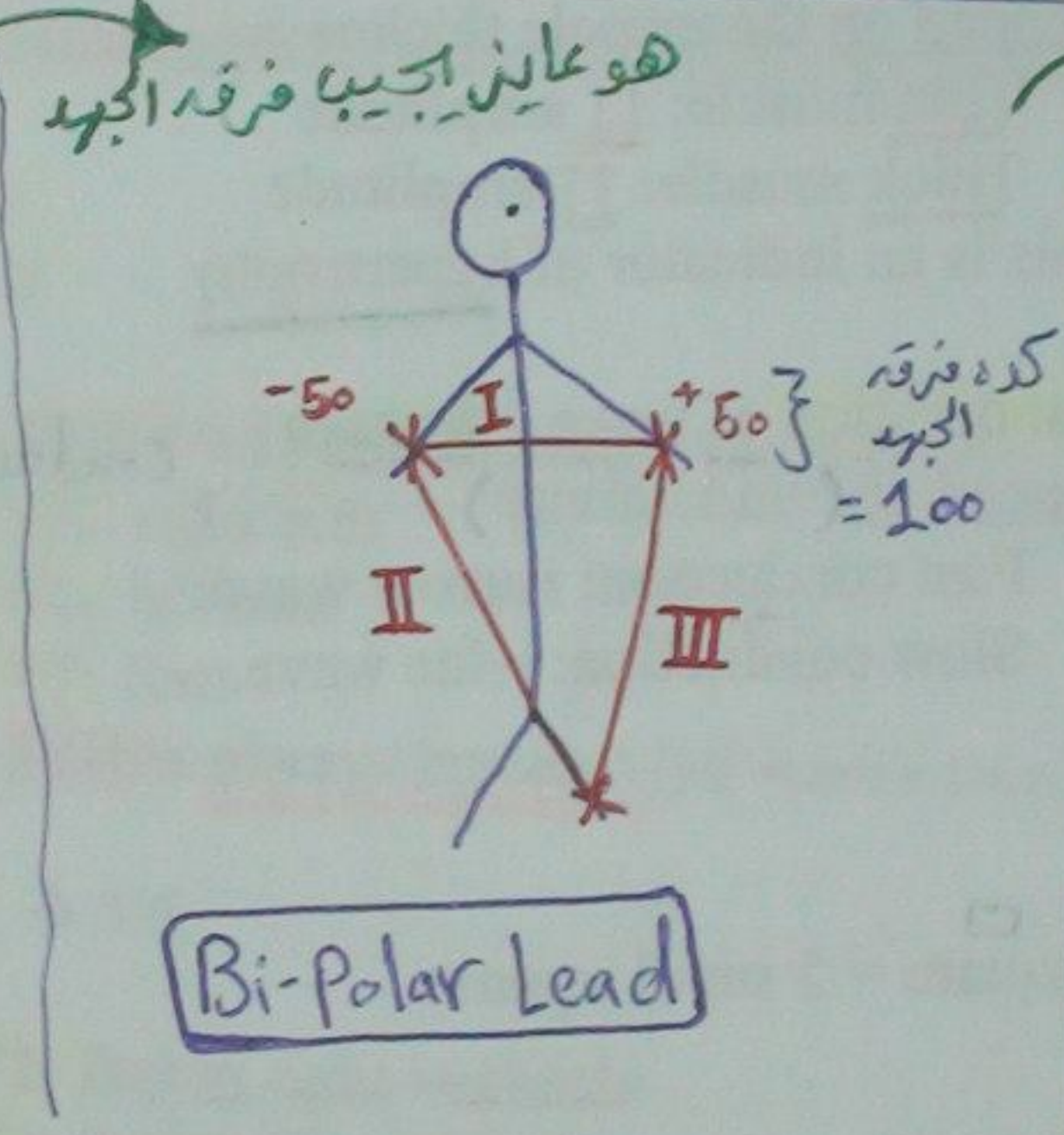


N.B. Atrial Repolarization → is Masked by QRS complex

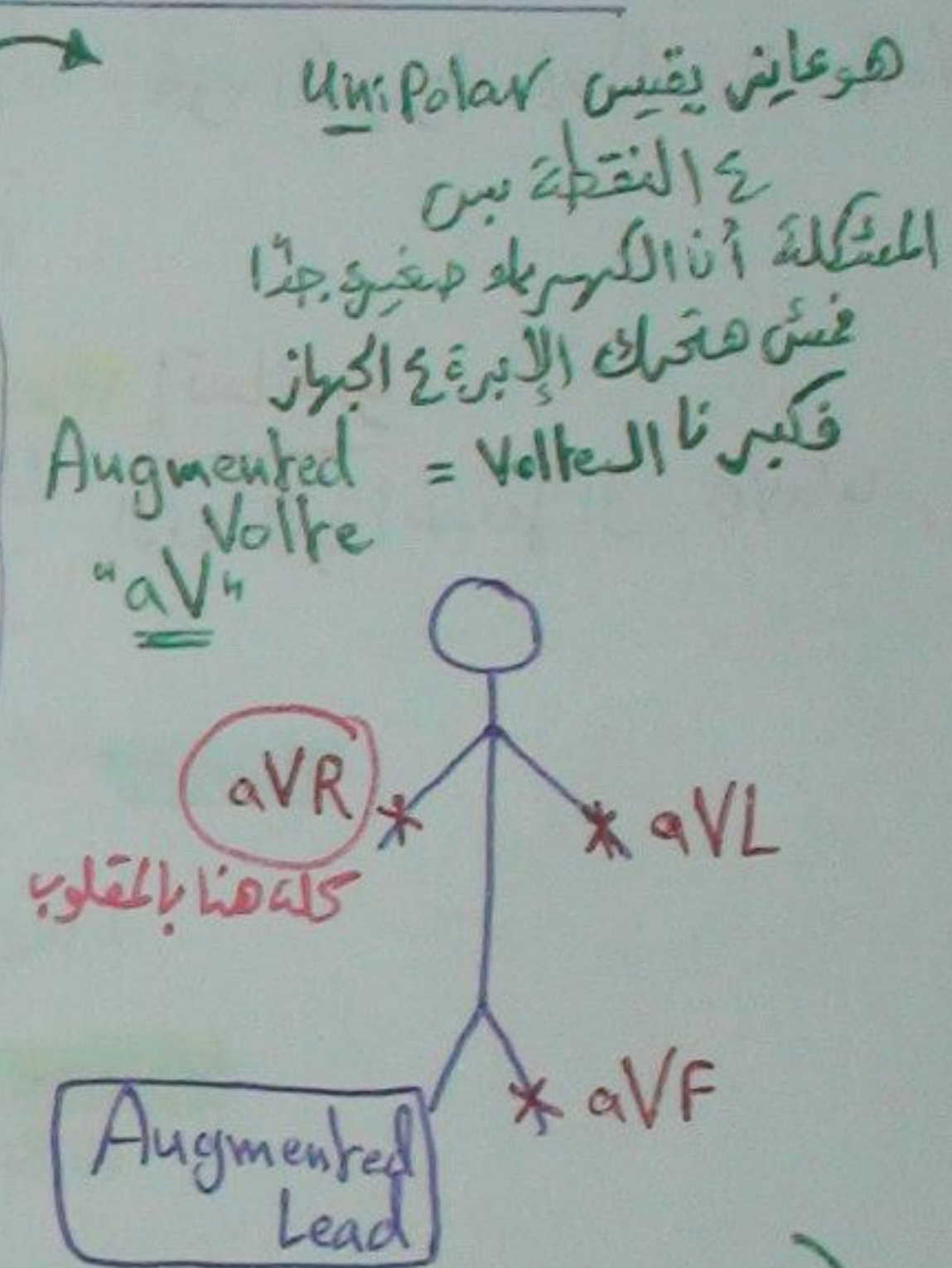


بسر يجرها أرضي  
 ولا ليس لازمة

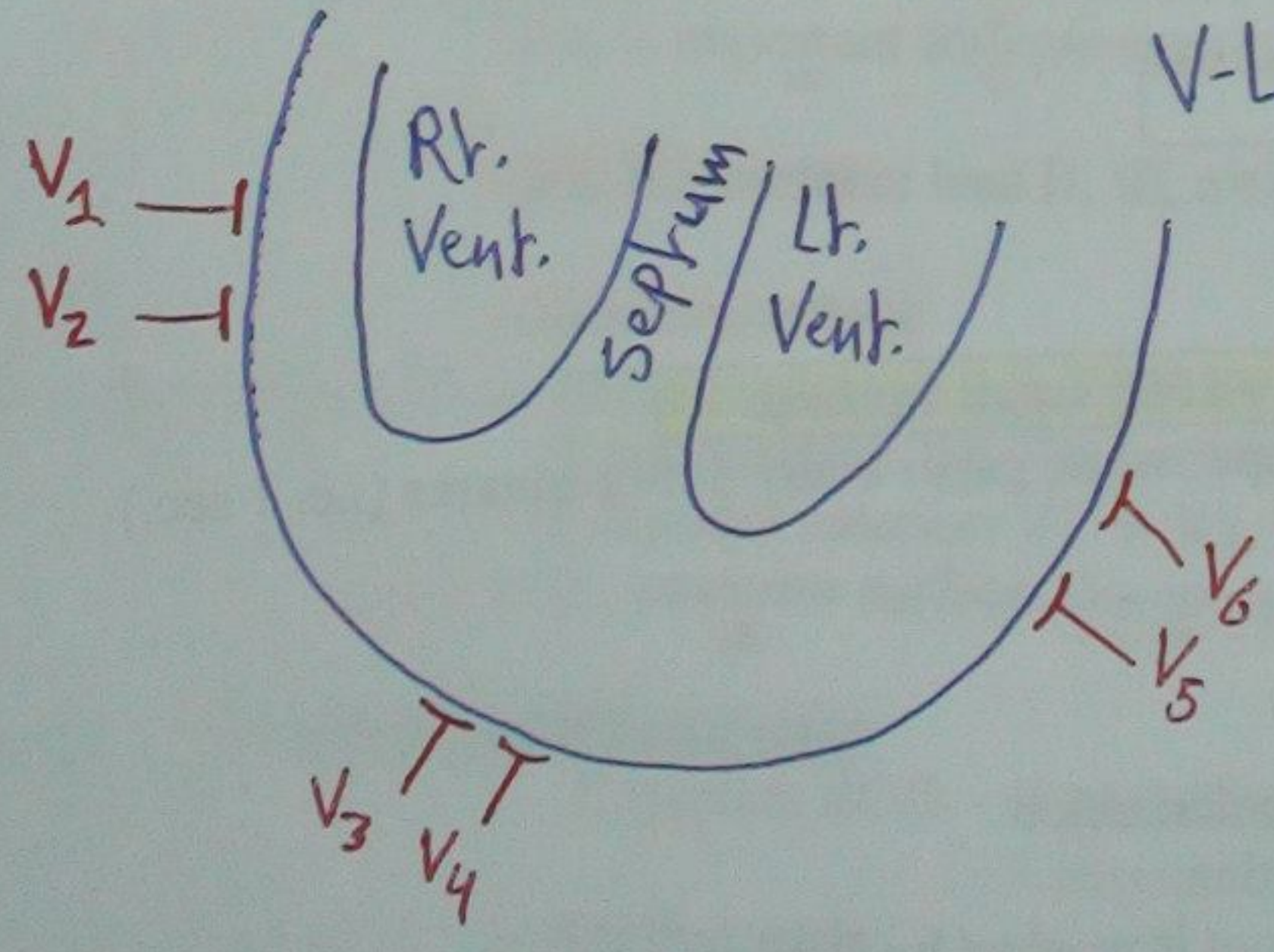
Limb Leads



Bi-Polar Lead



Augmented Lead



V-Lead هو عاين يسجل في الصدر بين فعل ال



## Electrical & mechanical conduction of the heart:

SAN → both atria → AVN → AV bundle (of Hiss) → Bundle branches (right & left) → both ventricles (simultaneously)  
Both atria are 1 unit  
Both ventricles are 1 unit

### AVN:

- موصلانية - Conduct electricity from atria to ventricles
  - معطلانية - Delay conduction till atrial contraction (**physiological delay**)
- N.B.: Accessory pathway → [ventricular pre-excitation] → Ventricle  
عندهم كبير e.g.: Wolf-Parkinson-White syndrome (WPW) → Short P-R

عشان ما تنعش  
30% of Atrial contraction

**Electrodes** = **Leads**: 12 leads in every patient even if normal

### Limb leads:

**Bipolar limb leads**: measure the difference between 2 limbs

I  
II  
III

**Unipolar limb leads** (augmented voltage lead):

aVR: right arm  
aVL: left arm  
aVF: foot

N.B.: **aVR** is always inverted (all waves away from it)

إذا حسبنا أن ترتيب ال Leads متناظر  
أدور على Lead كل واحد -

بقدره aVR

- اليمين هو III  
- اليمين هو aVL

**Chest leads**: V1 → V6

V1 & V2: facing right ventricle  
V3 & V4: facing the septum  
V5 & V6: facing left ventricle

هنا

**Topography**: relation between leads & heart surfaces  
This is important for [coronary heart diseases]

إذا تغيرت ال ECG موجودة في كل ال Leads  
it's Global disease

إذا تغيرت ال ECG ماشية في Leads معينة

Topography =  
"C.A.D."

**Inferior surface**: lead II, III, aVF

**Anterior surface**:

Antero-septal: V1 → V3 ± V4  
من الشمال لغاية ال Septum

Antero-lateral: V5, V6, I, aVL

Extensive anterior: V1 → V6, I, aVL

N.B.: posterior surface: Oesophageal leads

### Methods of recording:

1- Complete ECG: - single channel

- 3 channel

2- Rhythm: strip

2 Lead

وسا به الجهاز يشتغل لمدة دقيقة واحدة

عشان نشوف ال H.R.

12 leads I, II, III, aVR, aVL, aVF, V1 - V6

|     |     |    |    |
|-----|-----|----|----|
| I   | aVR | V1 | V4 |
| II  | aVL | V2 | V5 |
| III | aVF | V3 | V6 |

حديت الجواز فيه 4 ابر 3 واحد واحد تحت ترسم



## Exam: نظام الاختبار

ورقة متصورة على الأجل  
شكل الورقة

Photocopy: either:  
- Complete ECG Or 12 lead  
- Rhythm strip Or 2 lead  
- Both: complete & rhythm strip in 1 paper

شكل اللجنة

اللجنة: One of the followings:

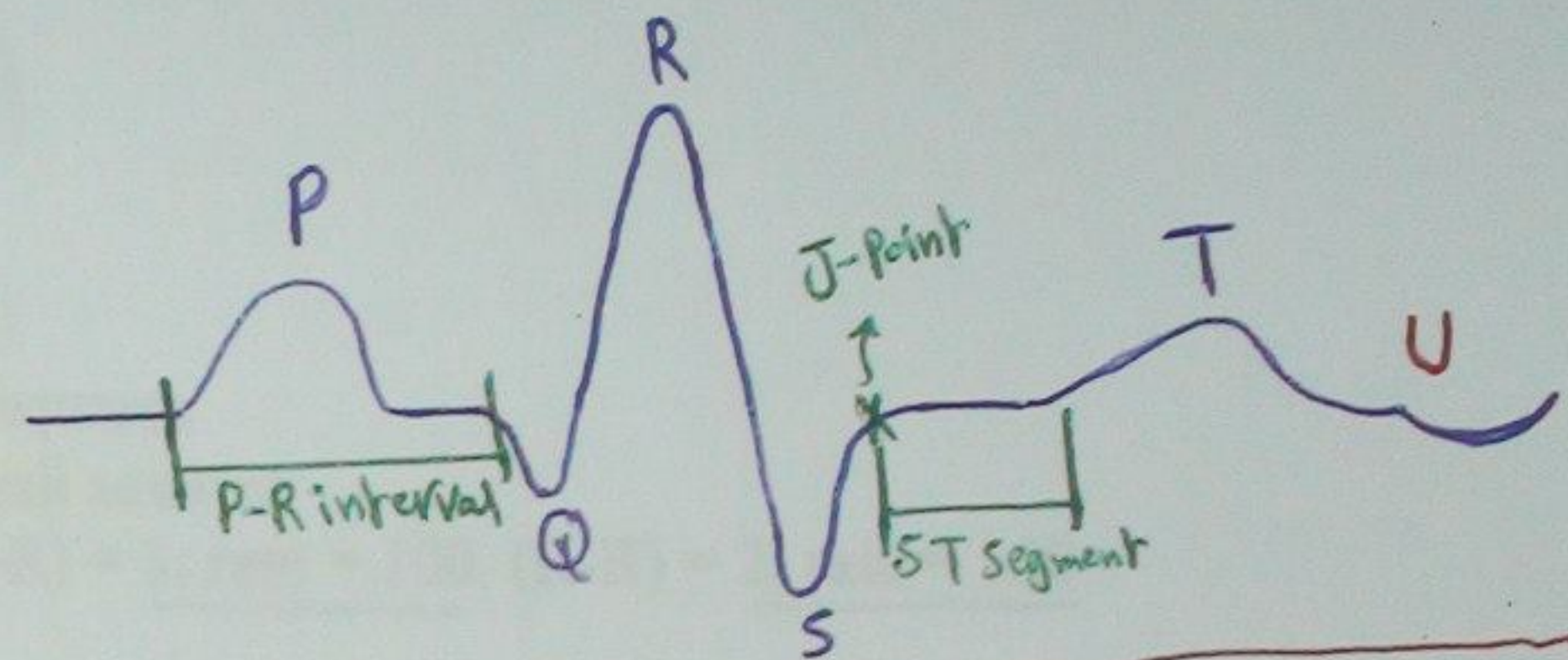
- Oral
- Stations with report
- Stations with questions

write Full Report

⊕ Short case e.g. an old man & chest Pain  
H/O  
what is your Dx?  
e.g. Comment on P-wave?  
e.g. what is your best line of ttt for this condition

## ECG REPORT

- ± Calibration
- Ventricle
- 1- Rhythm
  - 2- Rate
  - 3- Axis
  - 4- P wave
  - 5- P-R interval
  - 6- QRS complex
  - 7- ST segment
  - 8- T wave
  - 9- QT interval (postgraduate)
  - 10- U wave (postgraduate)



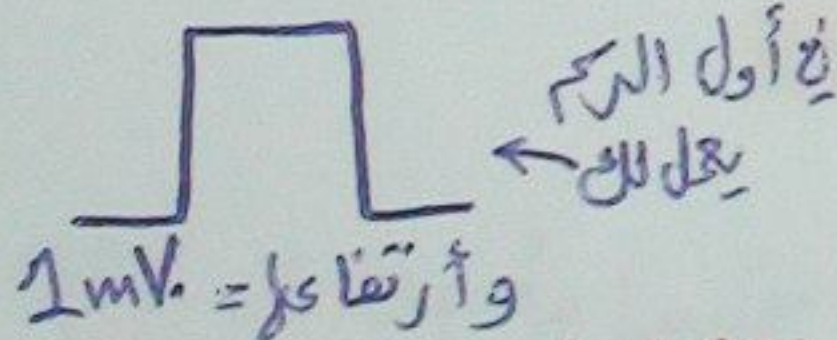
\* أي حاجة ما يكون قبل حاجة " " تبقا بتعب عن ال Ventricle  
إذا عاين Abrium لازم هيكتب الأول

## Diagnosis

## NORMAL ECG

## Calibration: العيارية

حسب هو مكتوب في الرسم  
ولا لا



ما تحلقش عليه؟ إذا اللجنة مخطوطة  
والدكتور قالك أي ده؟

Normal: 10 squares = 1mV (standard calibration)  
If electricity increased: 5 squares = 1mV (half calibration)  
If electricity decreased: 20 squares = 1mV (double calibration)

## Rhythm:

### a- Source of impulse:

SAN: sinus rhythm

AVN: nodal rhythm

Ventricle: ventricular rhythm

supraventricular rhythm

Diagnosis of source of impulse by:

### P wave:

Direction: +ve or -ve

Relation to QRS complex: before or after



\* ال ECG البخل - مفيشوش  
 Rate  
 Rhythm  
 "Can Not be Determine" لازم تذكر  
 بيتزل في الاختبار

أفرضها عملت ECG لقيت ال HR اتحول إلى مسطرة .... أيه الاحتمالات؟!



Handwritten text in a box, possibly a note or a question related to the ECG waveform.



### QRS complex:

Width: (narrow or wide)  
 Shape: (normal or bizarre)

Normal: = sinus rhythm → from SAN

P wave: +ve before QRS complex

QRS complex: narrow, normal in shape

### b- Regularity:

According to ventricle

Measure the space between two successive QRS waves. R to R (or S to S)

Normally: regular

N.B.: there is very minimal irregularity due to respiration  
 (respiratory sinus arrhythmia)

→ In an ECG with a single beat in each lead we can't determine rhythm (البخيل ECG)

**Rate:** number of ventricular beats/min

#### a) If regular

المسافة بين 2 أو استعمال التقريب

3 Big □ = 3 Big □ + 1 small □  
 4 Big □ = 3 Big □ + 4 small □

300 / (R-R) or (S-S) in big squares  
 1500 / (R-R) or (S-S) in small squares  
 If (R-R) = 4: rate = 75, (R-R) = 3: rate = 100, (R-R) = 2: rate = 150

#### b) If irregular:

- If rhythm strip is available  
 Calculate No. of R (or S) in successive 6 marks (6 sec.)  
 This No. is multiplied by 10 = rate
- If complete ECG: 300 / (average R-R)  
 Determine average R-R:  
 Divide 300 over average R-R → rate

→ In an ECG with a single beat in each lead, we can't determine rate (البخيل ECG)

### Axis:

[Is summation of electrical forces in ventricle]

حسب محصلة ال QRS



أقصى الشمال

أقصى اليمين

#### Determination:

|        |        |                      |                     |                          |
|--------|--------|----------------------|---------------------|--------------------------|
| I      |        |                      |                     |                          |
| aVF    |        |                      |                     |                          |
| Result | Normal | Right axis deviation | Left axis deviation | No man's land (odd axis) |

ممن بين لا في الاختبار



## Significance:

| Right axis deviation                                           | Left axis deviation                                        |
|----------------------------------------------------------------|------------------------------------------------------------|
| Right ventricular enlargement                                  | Left ventricular enlargement                               |
| Vertical heart:<br>- Thin & tall<br>- Emphysema (ribbon-shape) | Horizontal heart:<br>- Fat & short<br>- Pregnancy, ascites |

→ N.B.: In rhythm strip, we can not determine axis

## P wave:

Represent: atrial depolarization

### Normal:

- Present
- Direction: upright (+ve), except aVR (inverted) & V1 (biphasic)
- Height: doesn't exceed 2.5 small squares
- Width: doesn't exceed 2.5 small squares

حجمه أقل من حجمه

2.5 x 2.5 small squares  
ما تعدد يبرهن

Lead: II or V1 or any available lead

## P-R interval:

Naming: from the beginning of P wave till the beginning of QRS complex

Represent: physiological delay in AVN

Normal: - 0.12 sec (3 small squares) to 0.2 sec (5 small squares).

### Abnormalities:

- Long PR interval i.e. > 5 small squares → heart block
- Short PR interval i.e. < 3 small squares → Preexcitation  
e.g.: Wolff-Parkinson White syndrome (WPW)

بشكل زيادة

مشيئة سريعة "ركبنا كبري"

شفوي

Leads: II, or V1, or any available lead

## QRS complex:

### Naming of waves:

- R: +ve part of QRS → Only +ve
- Q: -ve part of QRS not preceded by ANY +ve
- S: -ve part of QRS preceded by ANY +ve

حتى إذا عظم أو شغال

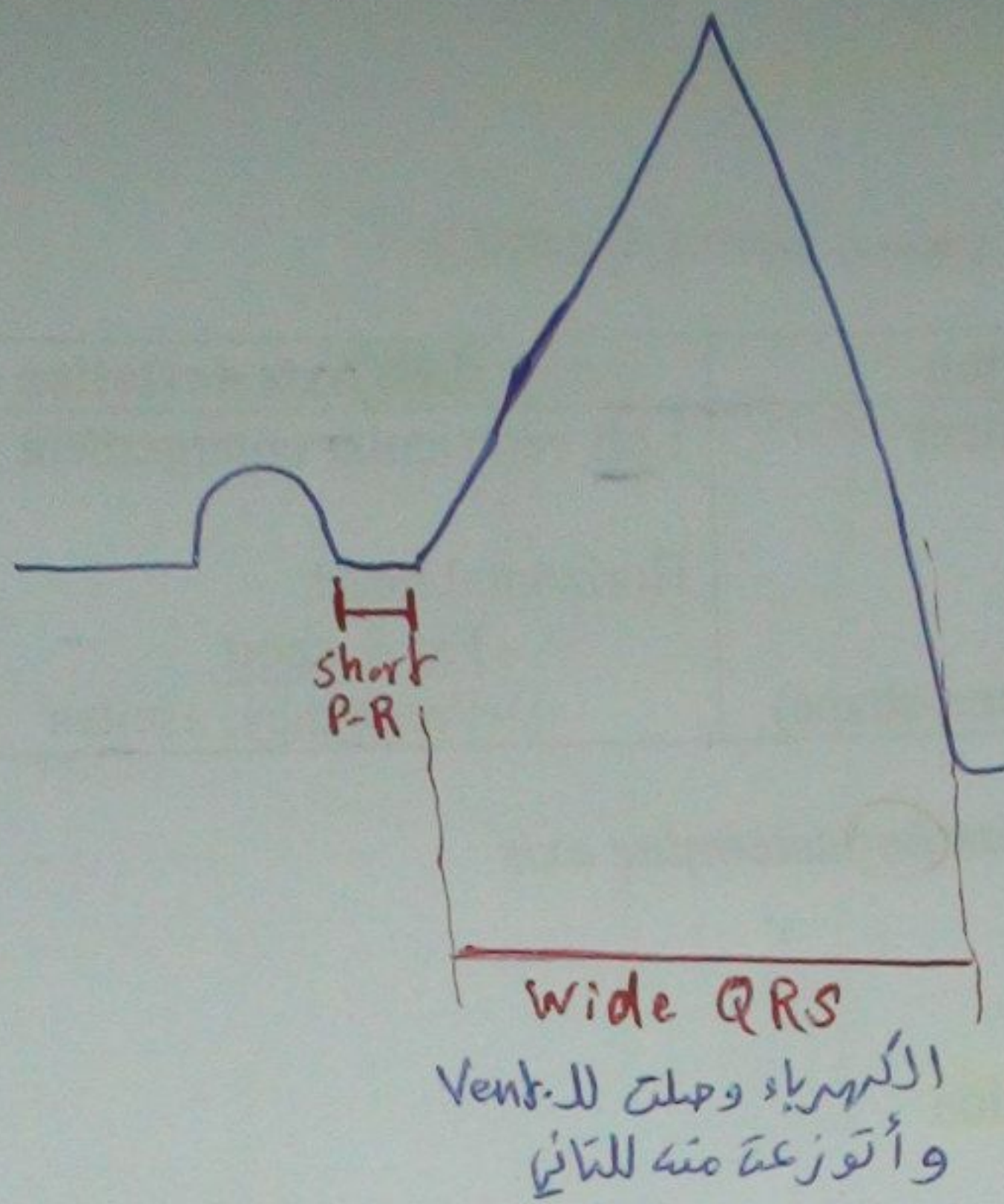


Represent: ventricular depolarization

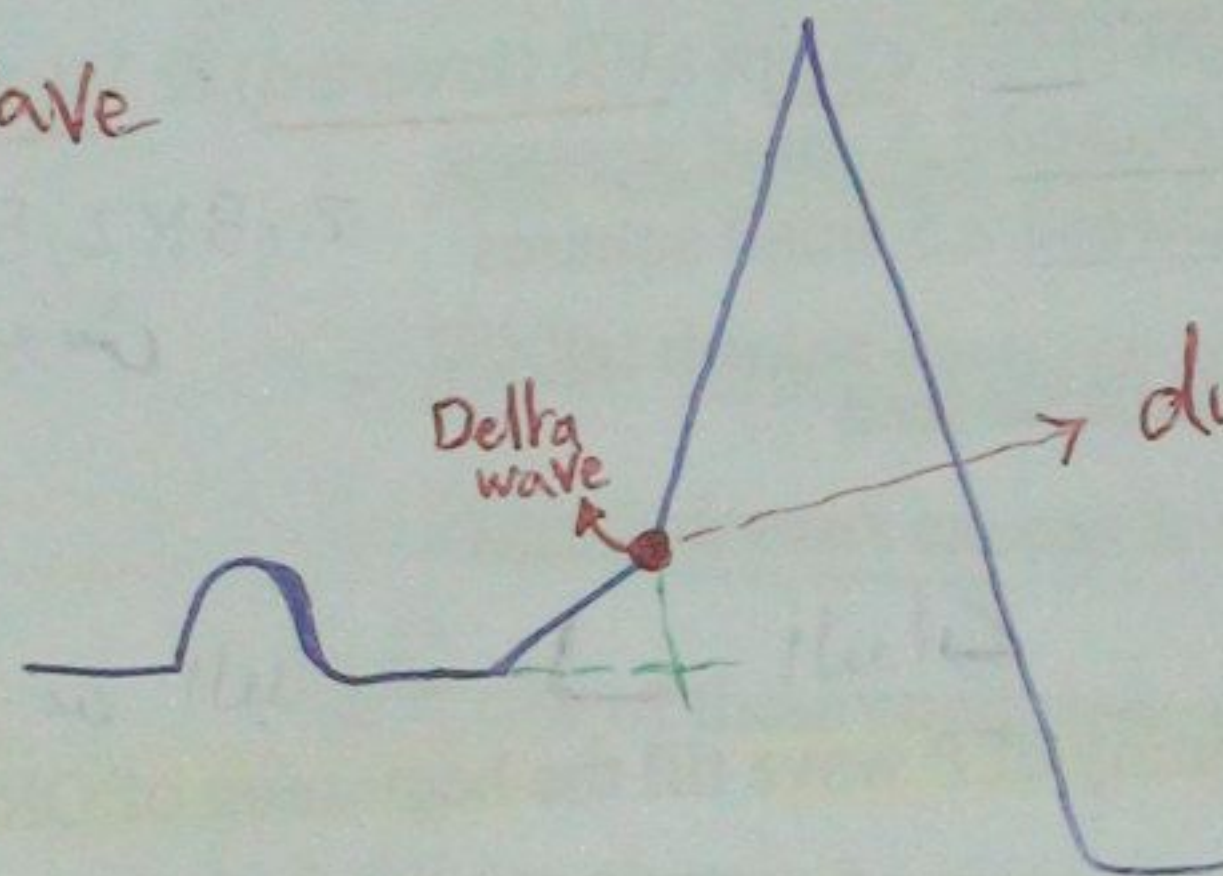
Normal: shape, width & height



WPW:-



• Delta wave



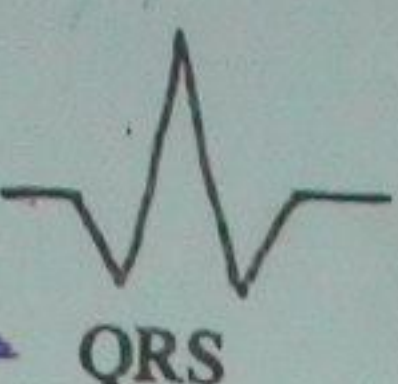
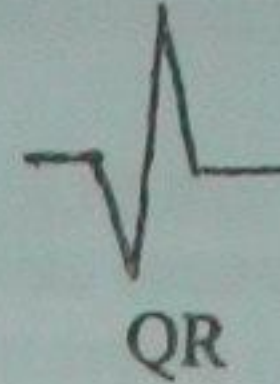
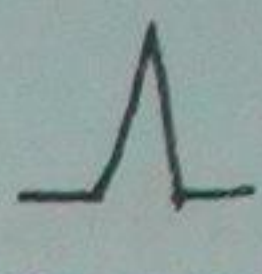
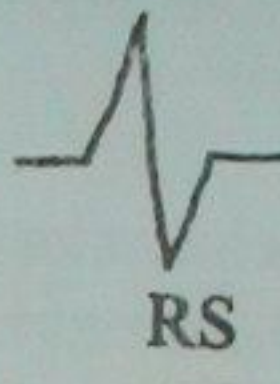
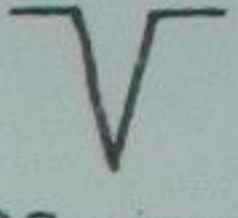
due to Augmentation of Electrical  
"Accessory Bundle"

(4)  
"AVN"



\* Wave كبرى و ثانية صغيرة ← تستخدم الحروف Capital & small  
e.g. rS

a- Shape: 3 waves, 2 waves or 1 wave

| 3 waves                                                                                  | 2 waves                                                                                   | 1 wave                                                                                              |
|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <br>QRS | <br>QR | <br>Monophasic R |
|        | <br>RS | <br>QS pattern   |

لازم يكون طبيعي  
1- طبيعي  
2- Q نفس طبيعة

لازم لو كان  
أن مقياس غير

But Q has to be normal: Characters of normal Q

Site: antero-lateral leads (V5, V6, I, aVL)

Width: doesn't exceed 1 small square ما يتعدى عنه

Height: doesn't exceed 2 small squares (or 1/4 R) ما يتعدى عنه

\* If one of these conditions are absent → pathological Q كارتية "رعب"

N.B.: QRS are always the same shape, if one is different → bizarre QRS

b- Width: narrow (doesn't exceed 3 small squares) !!!  
due to spread of electricity in the 2 ventricles at the same time

○ If width > 3 small squares → wide QRS

Causes: - BBB (Bundle Branch Block) عملي  
- Ventricular beat  
- WPW (preexcitation) شفوي كبرى

الكهرباء  
ما مشيتش مع بعضها  
⇒ QRS الـ واسع

شفوي للإصبيان

S<sub>1</sub> بتعالى

WPW:

Pathogenesis: accessory pathway كبرى

Characters: - Short P-R  
- Wide QRS  
- Delta wave

Complications: supraventricular arrhythmia

Short A/O

Man & Accentuated S<sub>1</sub>  
& Recurrent Arrhythmia



لا يقل عنه ولا يزيد

c- **Height:** 1 big square to 5 big squares (in chest leads)

- If height > 5 big squares → **high voltage**  
Causes: - Ventricular hypertrophy (narrow QRS)  
- Same causes of wide QRS

- If height < 1 big square → **low voltage**  
Causes: - Cardiac causes

Extracardiac causes: **MYXEDEMA**

↓ S<sub>1</sub>  
Mueffeld: S<sub>1</sub>

Emphysema  
Pericardial effusion  
Obesity

شفوف للإستبان

Def? ECG, QRS

مش جايه مبيع  
تفكر في مين؟  
Myxedema

Lead هو نفس ال  
تبع ال S-T&T

أحكام مئين

Lead: according to diagnosis: - Ischaemia: **topography**  
- Hypertrophy: **chest leads**

### ST segment:

Naming: from J-point till the start of T

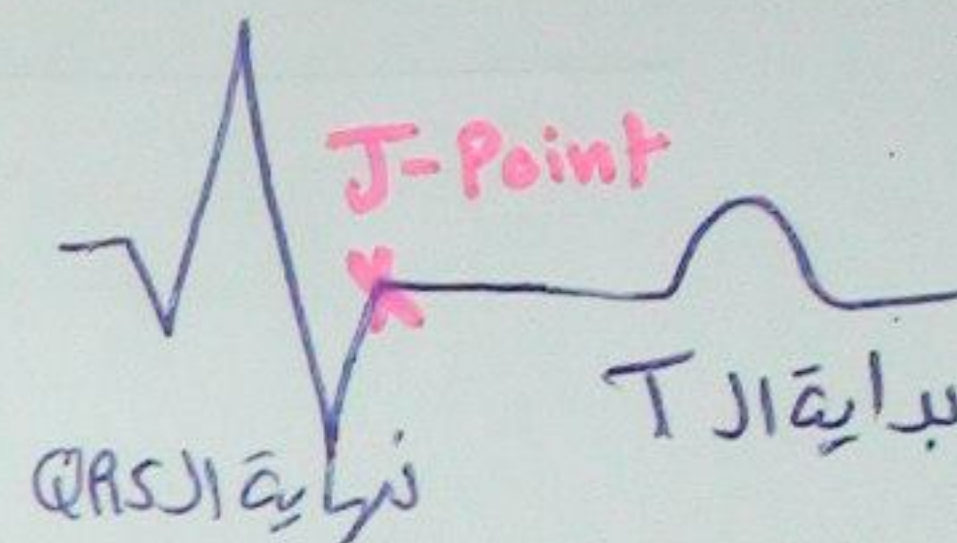
**J-point:** junction point, the last point in QRS

Represent: the beginning of ventricular repolarization

Normal: isoelectric (not elevated nor depressed)

لا عالية ولا واطية

Lead: same as QRS



### T wave:

Represent: continuation of ventricular repolarization

Normal: - Direction: upright (exceed aVR)

- Height: does not exceed 2 big squares

ما بعد شش  
مر بعين كبار

Abnormalities: - Inverted T

- Tall T

→ [Hyper-Acute T] = Hyper-Kalemia (K<sup>+</sup>)

Leads: as QRS & ST segment

→ é Acute Renal Failure

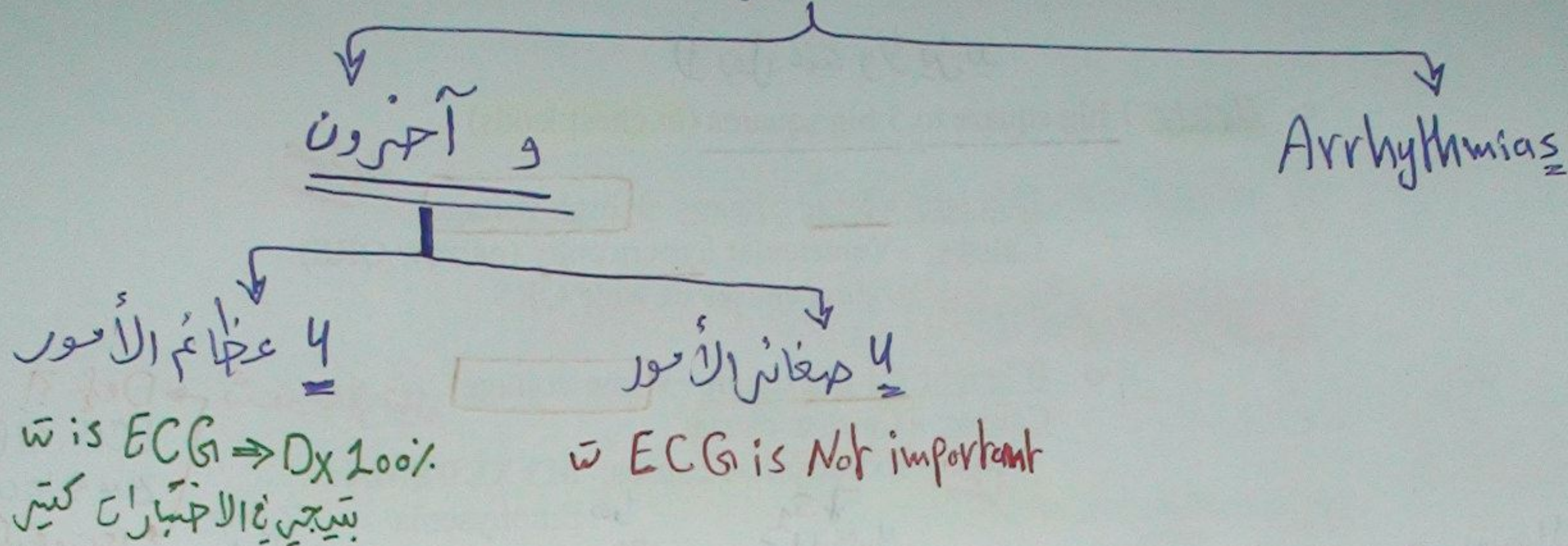
ودول بنعالجهم ب Dialysis

← فلا نرم أحلك للعيان ال K<sup>+</sup> Level

الدكتور يقولك معندش تحليل K<sup>+</sup> أعمل أليه؟! ← ECG



# ECG - عبارة عن



\* Incidence of "ECG" in Exams  $\Rightarrow$  Common  $\rightarrow$  Occasional  $\rightarrow$  Rare

"إذا شكيت في التشخيص  $\leftarrow$  Common is Common"

\* كل ECG .. هنتكلم ع 3 ثنائيات ..

1- تشخيصياً  $\rightarrow$  Lead  $\rightarrow$  أيه الـ أسوفه

2- الاختبار  $\rightarrow$  Incidence  $\rightarrow$  الصورة اليه بتنزله

3- Qs  $\rightarrow$  Reading  $\rightarrow$  أسئلة نظري



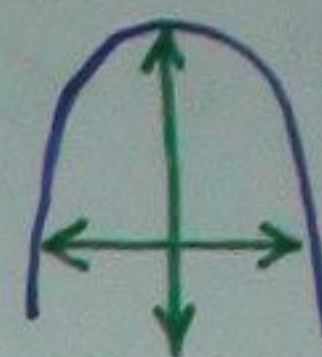
من عظام الأمور ←

## CHAMBER ENLARGEMENT

### A- ATRIAL ENLARGEMENT

**Waves & leads:** P wave, in lead II

**Normal P wave:** doesn't exceed 2.5 small squares in height or width



| Left atrial enlargement                                                                    | Right atrial enlargement                                               |
|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| <p>واسعة وزوايا البورنيلية</p> <p><b>Broad</b> bifid P (wide notched)</p> <p>P-mitrale</p> | <p>حويصلة ومُدْبِيه</p> <p><b>Tall</b> peaked P</p> <p>P-pulmonale</p> |

الأهم ودي لوحدها كفاية للشخص  
Cause حسب الـ Cause  
الأكثر

**Incidence:** occasional "لا كثير ولا قليل"

**Type of ECG:**

- Complete ECG
- ± Rhythm strip (especially of lead II)

إذا كان Lb. A. Enlargem.

Q.:

**Reading ECG:** Comment on P wave ?! **Ans.~ it's Broad Bifid in Lead II**

**Diagnosis:** causes:

Left atrium: MS, MR

Right atrium: PS

### B- VENTRICULAR ENLARGEMENT

**Waves & leads:** QRS & T in chest leads (V1 → V6)

↓ **Normal QRS:**

Good r wave Progression

↓  
في الـ chest leads  
فلا تغير "r"  
تبدأ صغير وتكبر

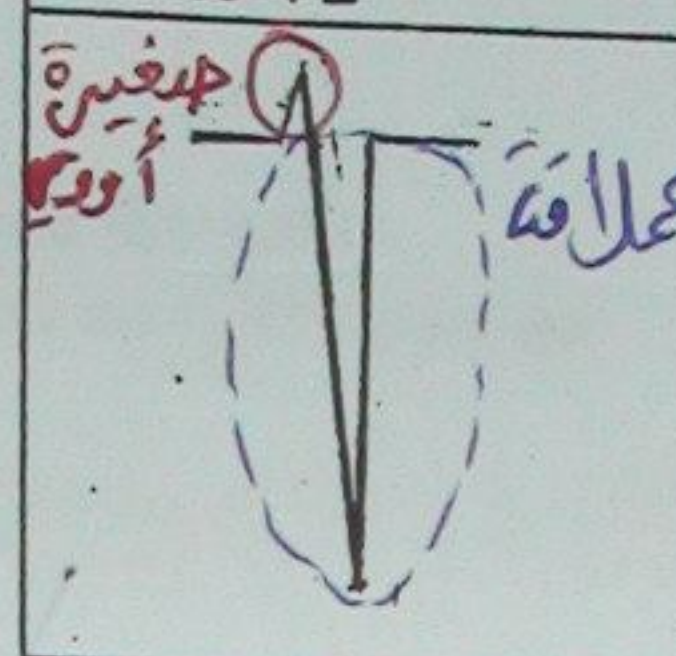
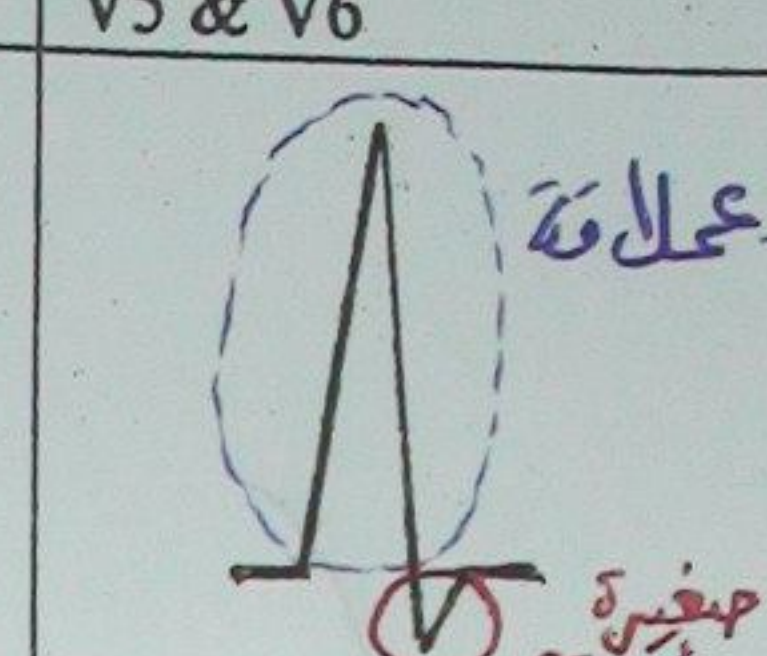
| V1 & V2   | V5 & V6   |
|-----------|-----------|
| <p>rS</p> | <p>Rs</p> |



## LVE:

### A) Voltage criteria: exaggeration of normal

في أيسر ←

| V1 & V2                                                                            | V5 & V6                                                                             |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |
| rS                                                                                 | Rs                                                                                  |

→ > 5 Big □

Tall R > 5 big squares in V5 or V6  
 Or Deep S > 5 big squares in V1 or V2  
 Or Tallest R + deepest S > 7 big squares  
 N.B.: In ventricular enlargement, QRS has normal width "Narrow"

1 } أيسر  
 2 } تشخيص  
 3 }

### B) ± Strain Pattern: = relative ischaemia (see page 13) In V5 & V6 (left ventricle)

ال Vent. اليمين

لف معاد شحال

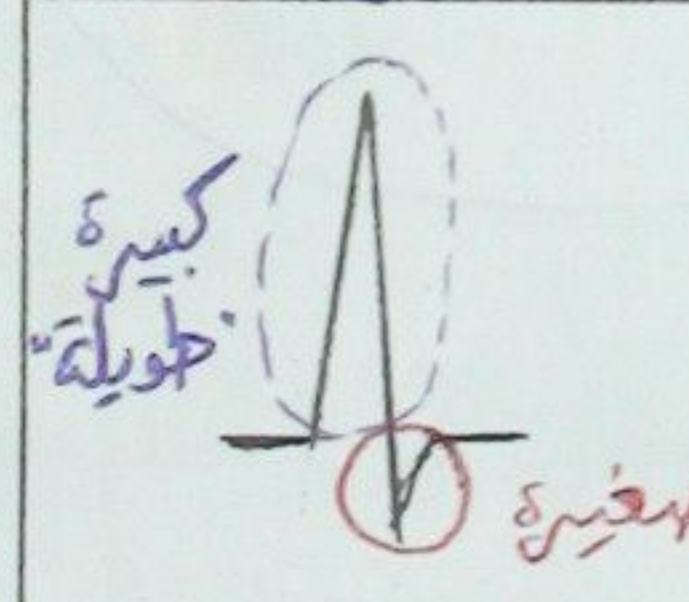
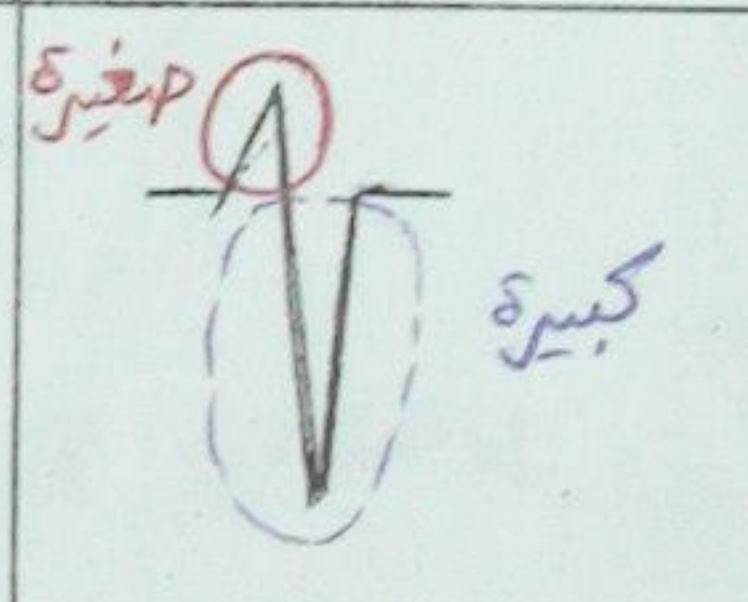
### C) ± Left axis deviation: Look at leads I & aVF

↓ Blood supply  
 ما زادش معاد

## RVE:

### A) Voltage criteria: reversal of normal

V1 only

| V1 only                                                                              | V5 & V6                                                                               |
|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |
| Rs                                                                                   | rS                                                                                    |

Tall R > S in V1  
 Or Deep S in V5 or V6  
 N.B.: In ventricular enlargement, QRS has normal width

1 } أيسر  
 2 } تشخيص

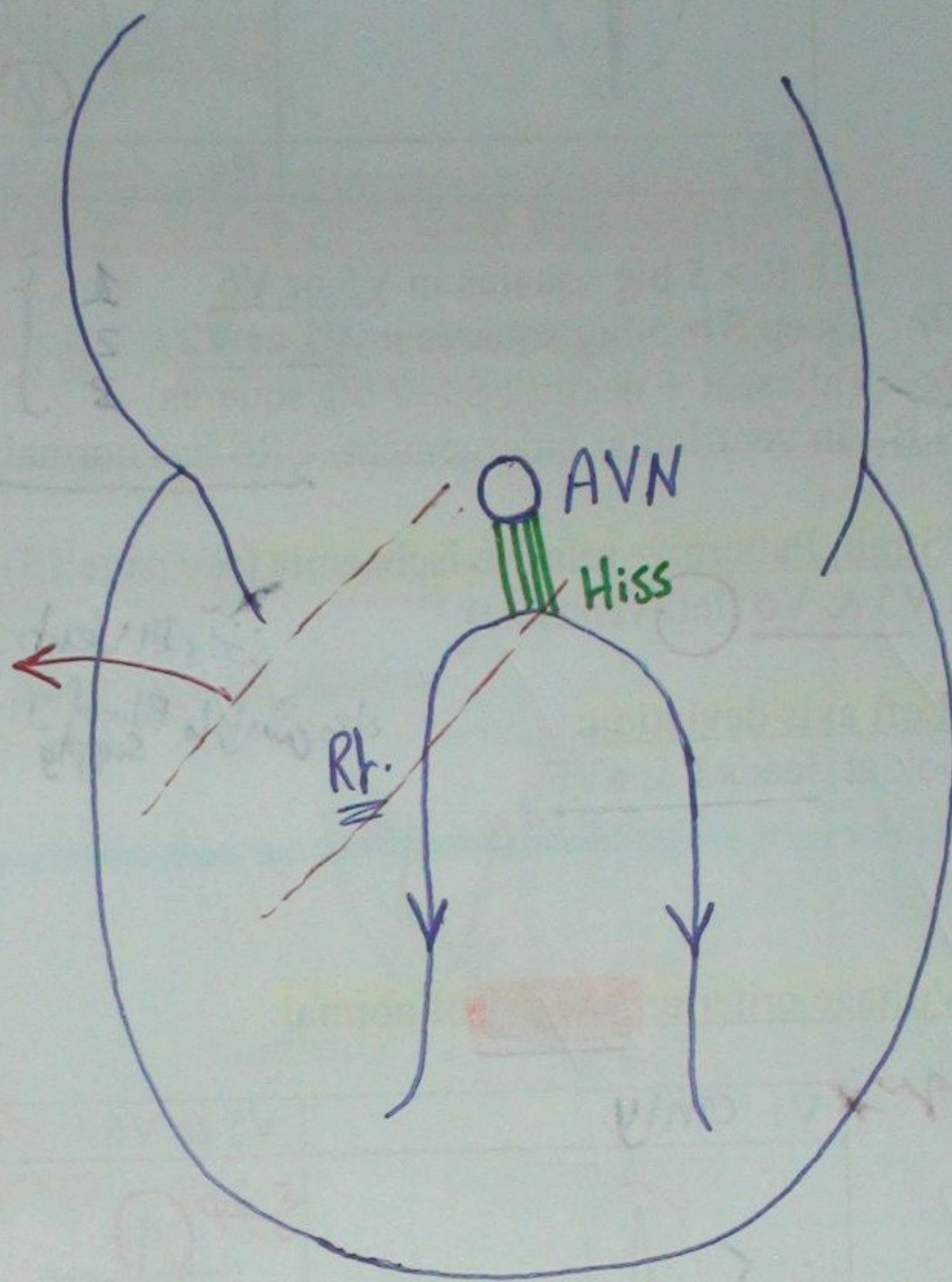
### B) ± Strain pattern: = relative ischaemia (see page 13) In V1 & V2 (right ventricle)

لف معاد يمين

### C) ± Right axis deviation: Look at leads I & aVF



at  
Inter-Atrial  
Septum





Incidence: Common جدا

Type of ECG: Complete لازم

Q.:

Reading:

Determine the axis

Comment on QRS voltage

Diagnosis: causes of LVE & RVE

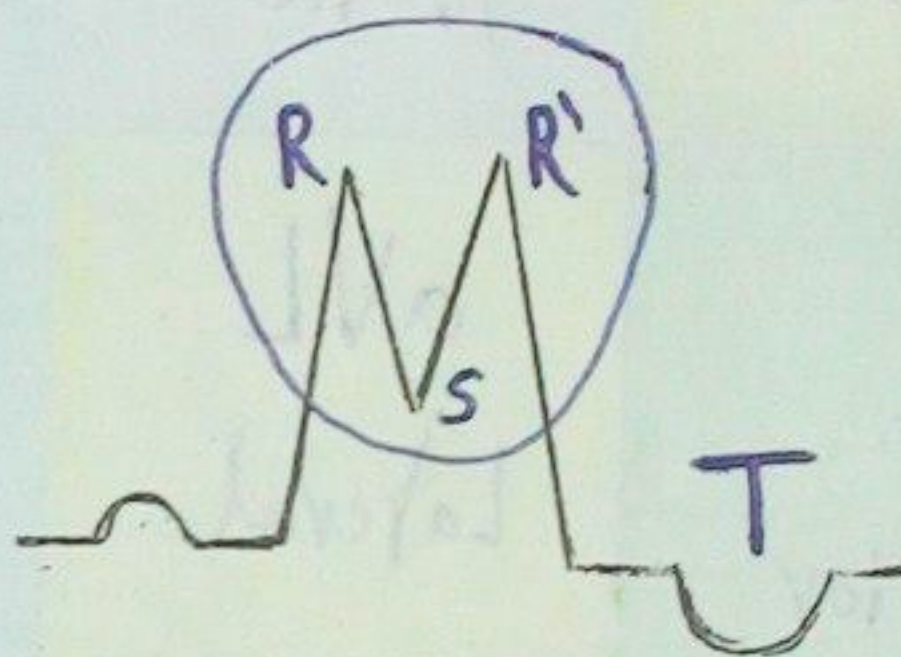
من عظام الأمور

## BUNDLE BRANCH BLOCK (BBB)

Waves & leads: QRS & T in chest leads (V1, V2 & V5, V6)

Changes:

- 1- QRS: - Wide QRS: > 3 small squares  
- RSR' pattern  
- High voltage > 5 big squares
- 2- T wave: ± Inverted T



شبه ال M  
بس ما نقولها شدة الجبهة

حسب شوت فين  
 $\begin{cases} V1 \& V2 \rightarrow RBBB \\ V5 \& V6 \rightarrow LBBB \end{cases}$

Incidence: common

Type: complete ECG ± Rhythm strip "إذا عنده"

Q.:

Reading:

Comment on QRS pattern  
Comment on QRS duration

e.g. - (wide QRS - taking the form of RSR')  
in V<sub>1</sub> & V<sub>2</sub>

Diagnosis:

Causes: - LBBB: IHD, cardiomyopathy

- RBBB: ASD IHD

هو مستوي فيه

قوجا ال  
Blood supply

ليج إذا جالك حد LBBB  
هتقعد Enzymes - في تشخيص  
ال MI

N.B.:

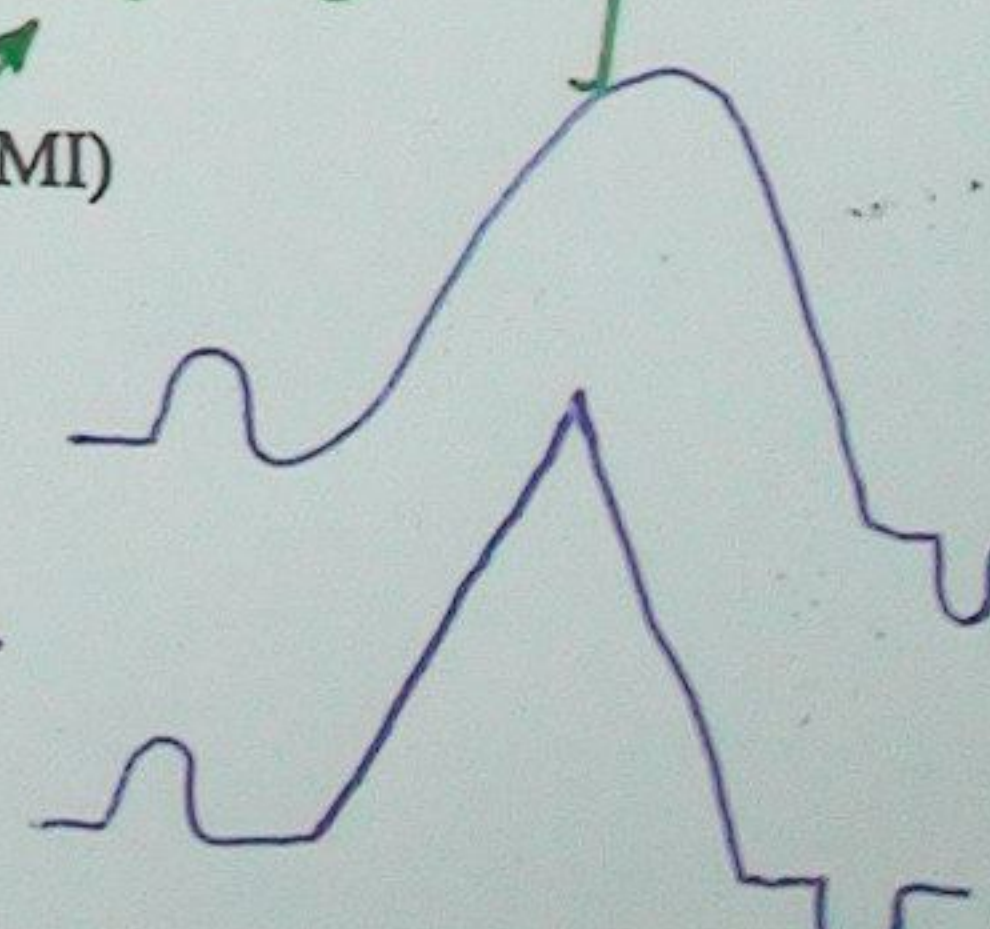
- In cases of BBB, don't diagnose associated LVE
- In cases of BBB, don't diagnose MI (BBB may simulate antero-septal MI)
- The pattern in LBBB may be wide monophasic R (instead of RSR')

غلا سات  
ممكن خلونك أشك  
بس أو عن تشخيص

LBBB

زيم الفريك

ما يحيش شريك





## Topography:-

|                 |                 |                |                |
|-----------------|-----------------|----------------|----------------|
| I<br>Lateral    | aVR<br>None     | V1<br>Septal   | V4<br>Anterior |
| II<br>Inferior  | aVL<br>Lateral  | V2<br>Septal   | V5<br>Lateral  |
| III<br>Inferior | aVF<br>Inferior | V3<br>Anterior | V6<br>Lateral  |



## Topography:

**Inferior surface:** lead II, III, aVF

**Anterior surface:**

**Antero-septal:** V1 → V3 ± V4

**Antero-lateral:** V5, V6, ± I, aVL

**Extensive anterior:** V1 → V6, ± I, aVF

**IHD:-** Narrowing: ischaemia (angina in clinical) H/o  
- Occlusion: infarction

## A- INFARCTION

**Waves & leads:** QRS, S-T segment & T wave with topography

لازم  
تقول فين

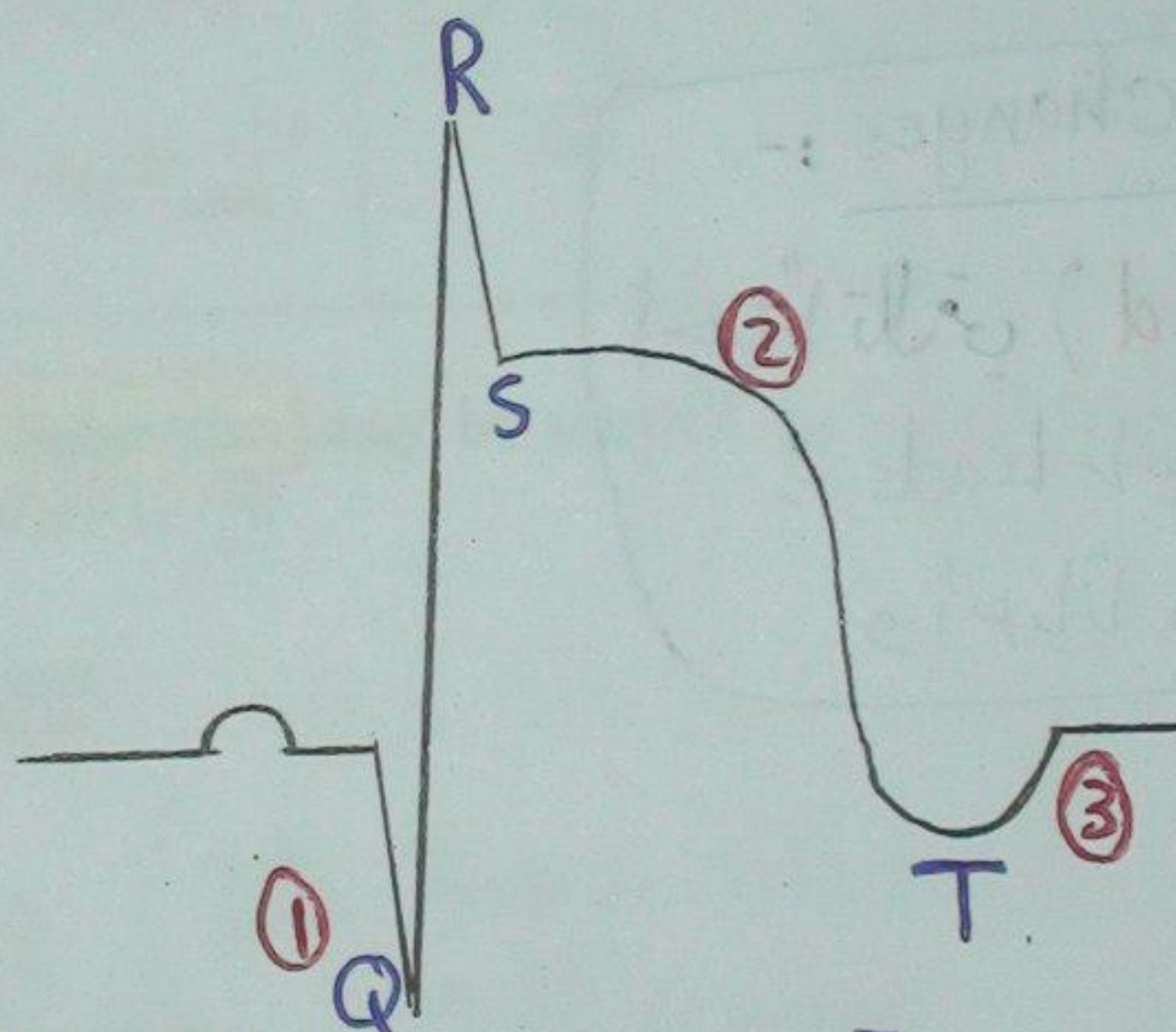
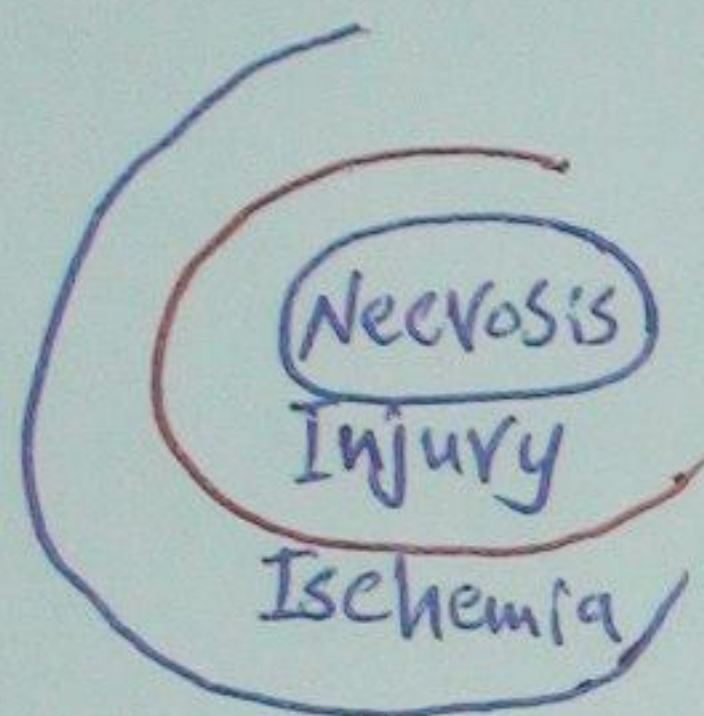
**Pathology:** 3 zones

**Necrosis:** local death of cells (permanent change)

**Injury:** severe ischaemia but not sufficient to produce necrosis (temporary change)

**Ischaemia:** decreased arterial supply

**Changes:**



- ① **Pathological Q:** (necrosis)  
Permanent till death (finger print infarction)

جيت مش ماشية

- ② **Raised coved ST segment:** (injury)  
Temporary, present only in recent infarction (4-6 weeks)  
Recent infarction: raised coved ST segment  
Old infarction: isoelectric ST segment

- ③ **Inverted T:** (ischaemia)  
Variable "Inverted"

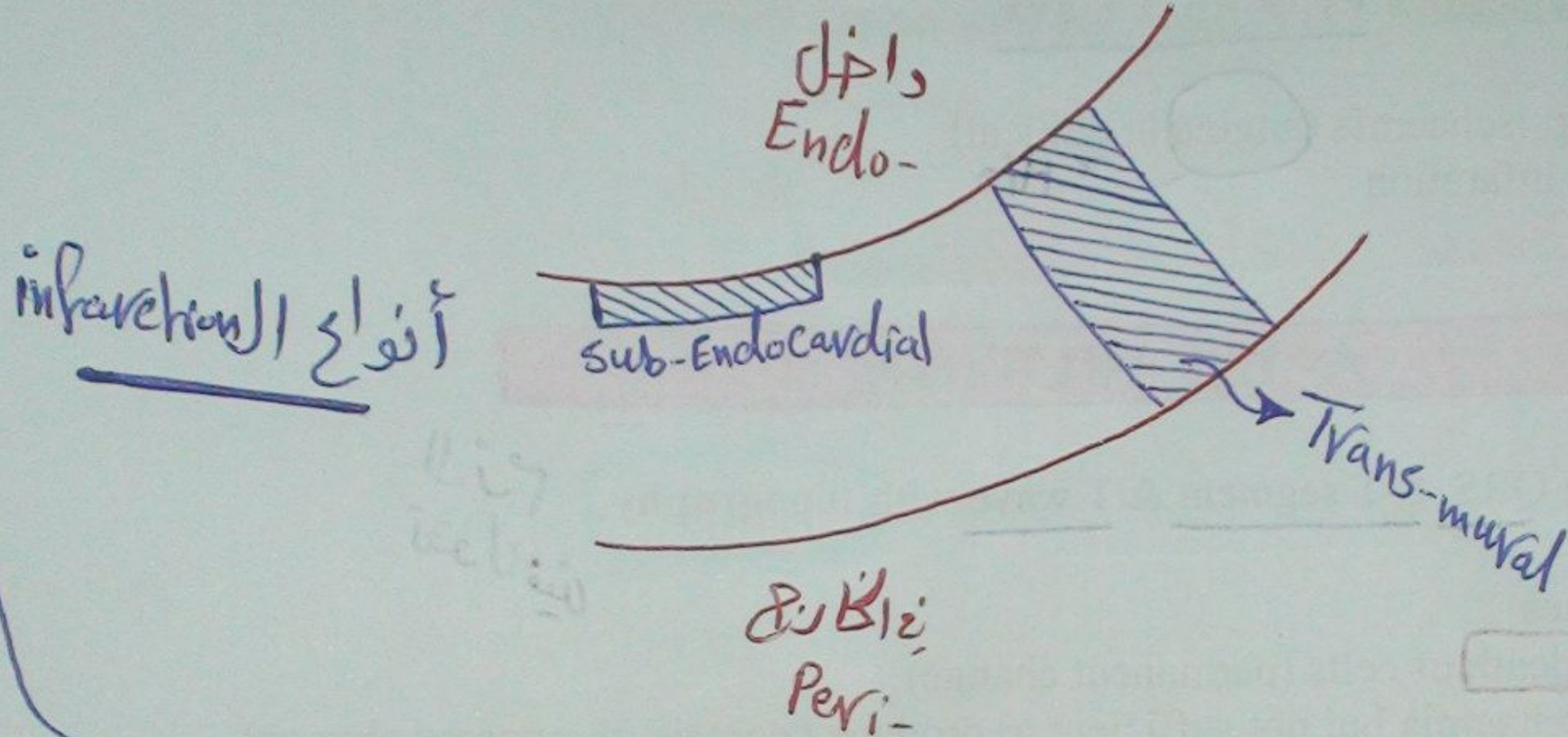
بس الأعلى أنزل بتصلح



✓ أمثلة ال Infarction تكون من غير Q!؟

1- Acute

2- Non-Q wave infarction



\* Reciprocal changes :-

أحياناً تلاحظي (ST depressed)

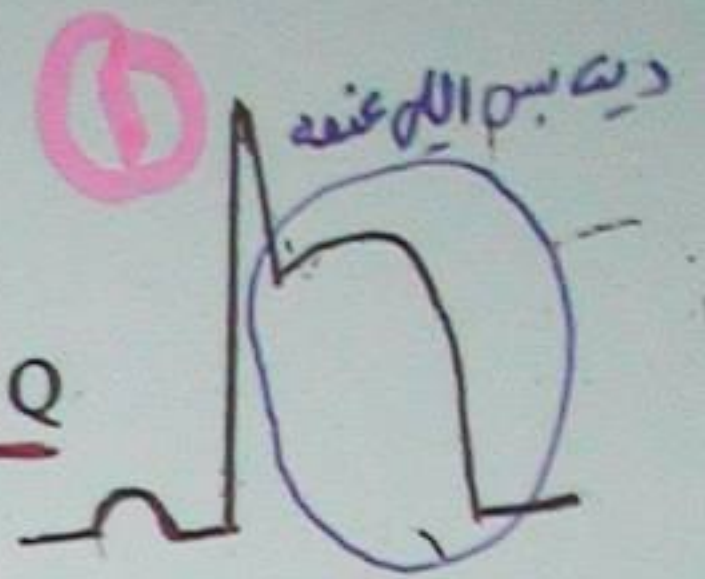
في Leads تانية غير تبعه ال MI  
و أحياناً ما تلاحظي



N.B.:

أحسن وقت تدبير فيه  
Thrombolytic Therapy

- **Acute infarction** = raised ST segment & hyperacute T wave without Q  
(before development of pathological Q wave)



- **Persistent elevated ST segment** = myocardial aneurysm

- **Non Q wave infarction** = subendocardial infarction  
Infarction without Q wave

Diagnosed by raised serum level of cardiac enzymes (Laboratory)

- Ant MI may appear with poor progression of r wave in chest leads

|                                                                                                                       | Recent    | Old           |
|-----------------------------------------------------------------------------------------------------------------------|-----------|---------------|
| R wave is present<br>وجود ال R = يعني أن ليس<br>في خلايا عايشة<br>و بتعطينا<br>كل ما تلاحظ<br>يبقى عيان كويس<br>حاليه | <br>STEMI | <br>Non-STEMI |
| R wave is absent<br>Q-S- Pattern<br>Infarction<br>"أ-و- infarction"                                                   | <br>Q T   | <br>Q T       |

Infarction  
بتنزل د 5  
ر شكل

ممكن يكون في كذا  
Infarction

أحذر

N.B.: **double infarction** may be present in the same ECG, one of them is recent & the other is old

Incidence: commonest

Type:

Complete ECG  
(Topography)

(e.g. There's Pathological Q in Lead II, III, aVF)  
+ ST segment

Q.:

Reading:

2- Comment on ST segment (raised or isoelectric)

1- Comment on abnormal wave = pathological wave: path. Q in leads (specify) Comment on QRS

Diagnosis:

Early complications of M.I.:

Commonest is arrhythmia (commonest of which is extrasystole)

N.B.: extrasystole may appear in rhythm strip of infarction

لا نرم تقول

1- Time - Recent, Acute, old  
2- site - Topography حسب

فلا تبجي في ال ECG  
ما تركزش عليه وتنسى ال MI ! 12



من عظام الأمور ←

## B- ISCHAEMIA

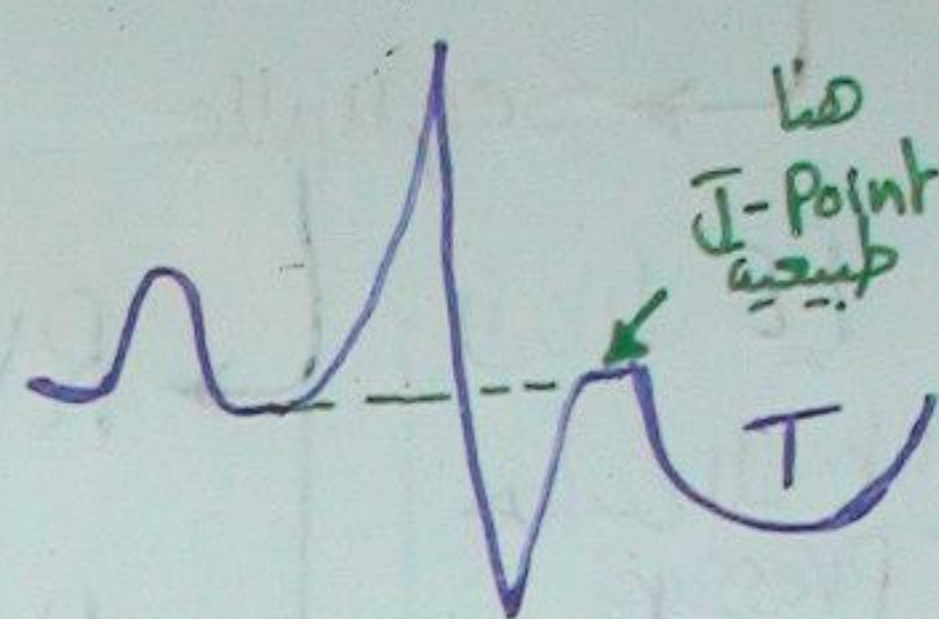
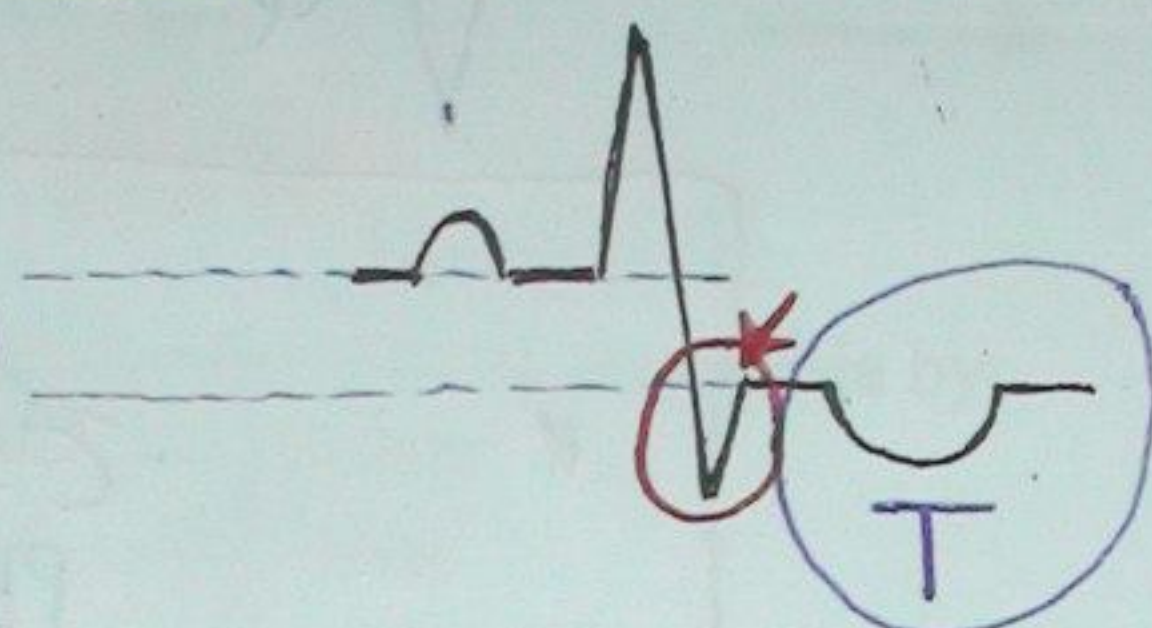
**Waves & leads:** S-T segment & T wave with topography.

لازم  
تقول فين

**Changes:**

**Depressed ST segment** (with depressed J-point)  
&/or **Inverted T**

لازم تكون إنتم



هذا  
J-Point  
طبيعية } So,  
Not  
Ischemia

**N.B.:** **Strain pattern:** = ischaemia occurring with chamber enlargement

**Incidence:** rare

تبان في القلوب  
التي في الـ  
Ventr.

Chamber  
Enlargement  
Ischemia دور في

**Type:**

Complete ECG  
Topography

**Q.:**

**Reading:**

Comment on ST segment: depressed with depressed j-point  
Comment on T wave: inverted in leads (specify)

Vaso-spastic Angina = Variant Angina = Prinzmetal's Angina (VSA)

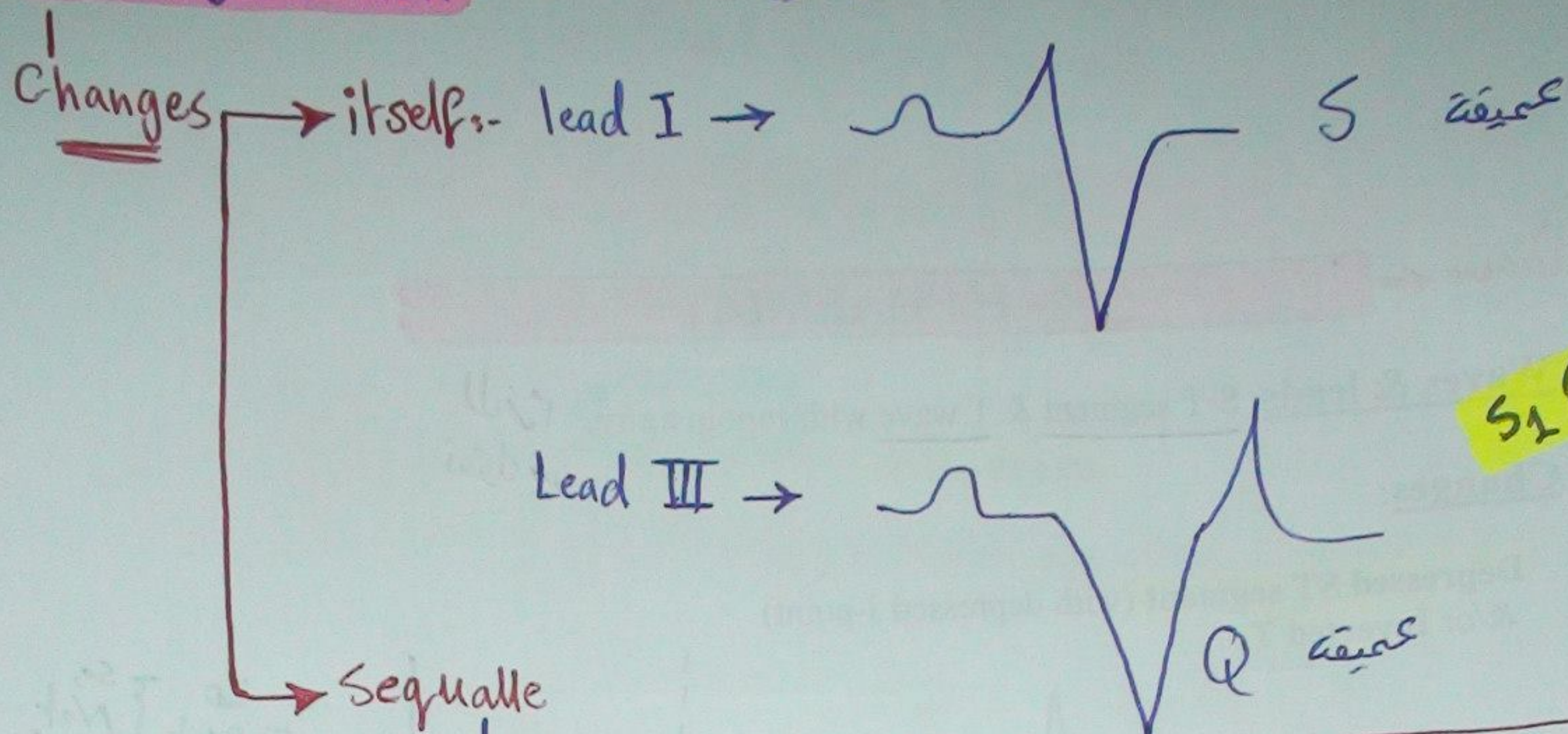
Ischemia تيجري ومعالها ← (Elevated ST segment)

← أيوه، التي تكون ناتجة عن Spasm

Atherosclerosis من



## ● Pulmonary Embolism: "هنا دور ال ECG محدود"



PE ال  $\left\{ \begin{array}{l} \rightarrow RVE \\ \rightarrow RBBB \end{array} \right.$

Rh. Vent. ال تحت ال ضغط  
Under pressure

"بيجيبيو ب Case H/O"  
عيان عمل عملية؛ ودلوقت بيكح  
فلانم تلفت لل PE

Q: Investigations? - Pulmonary Angiography "Best but invasive"  
- Multi-slice CT  
- Ventilation/perfusion lung scan

## ● Electrolyte Disturbance [Hyperkalemia] "هنا دور ال ECG محدود"

↓ نزلة آخر سيقن ورا بعين

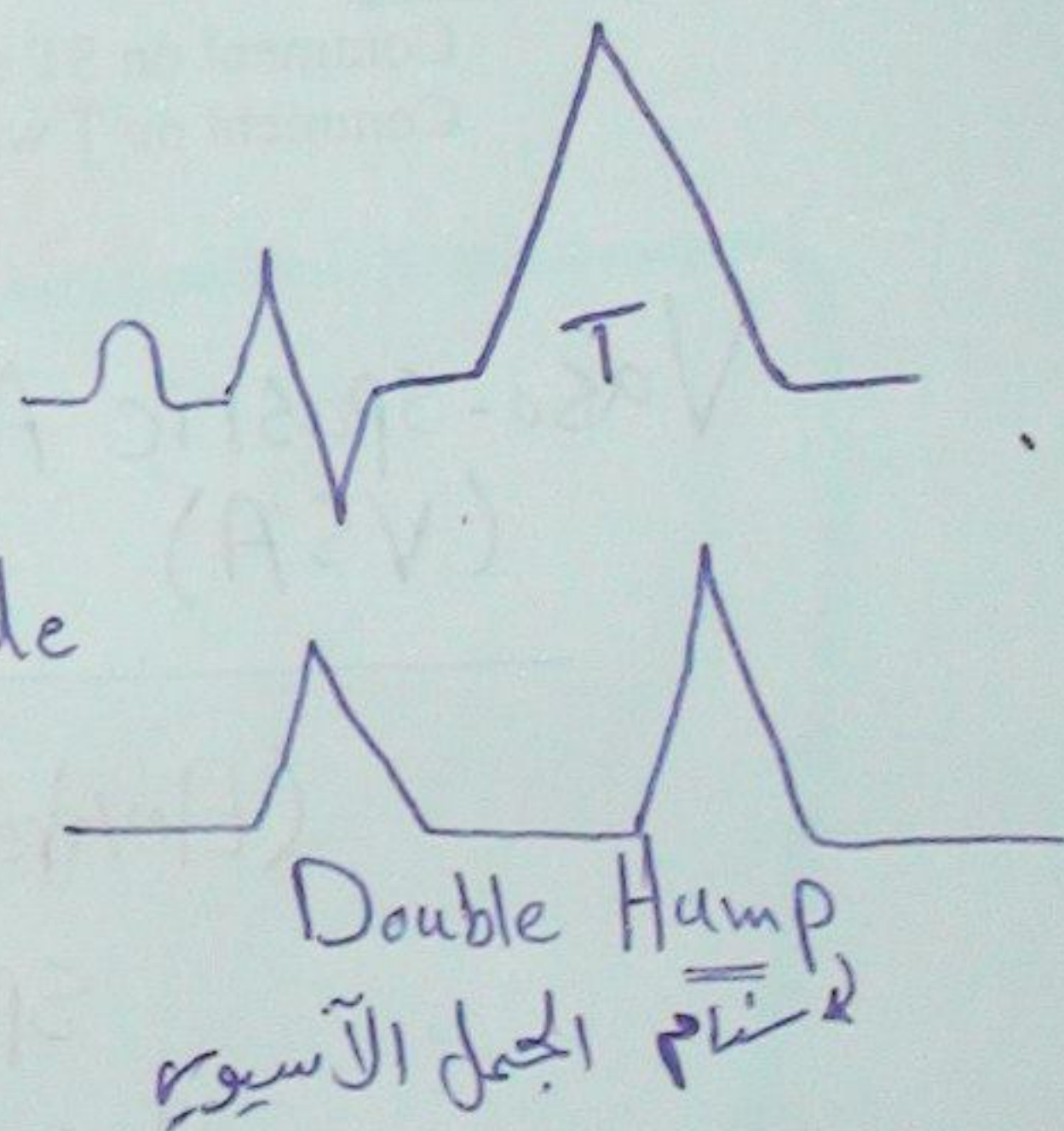
- Normally, serum K<sup>+</sup> — up to 5.5 mEq/L.

ومع كل ارتفاع لوال Level — خيران متحول

• Mild "6" → Tall, Peaked, wide "T wave"

• Moderate "7" → P wave: اختفت / QRS: wide  
(+) T wave: زيالة فاة

• Severe → (+) Vent. Arrhythmia  
e.g. Vent. Tachycardia



Q: 2 Line of Ht rather than Dialysis? ①

② Myocardial Excitability  
via Ca<sup>+2</sup>

→ Elimination of K<sup>+</sup>  
also, via Loop diuretics

③ Temporary Measures — to 7 complication of Rapid K<sup>+</sup> shifting  
via Insuline, Salbutamol

"بيجيبيو ب Case H/O"  
This Man on dialysis  
العيان الـ بيحصل مخرج ال Electrolyte  
Disturbance



Case H/O - Man e Chest Pain & Auscultatory Rub  
 or - Man e Pain on Dialysis → = Renal Failure  
 Pericarditis

صفات الأمور

## PERICARDITIS

**Waves & leads:** S-T segment & T wave in all leads. Except aVR

**Changes:**

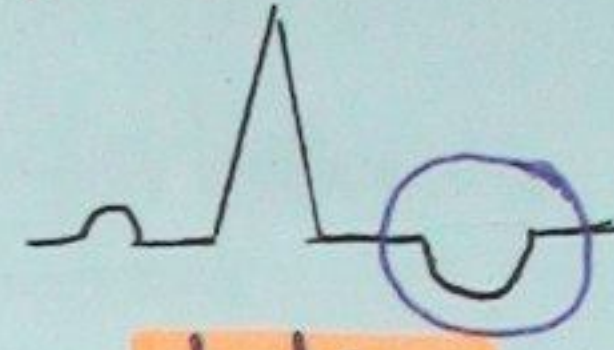
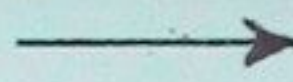
**Early pericarditis:** raised & concave up ST segment

**Late:** inverted T

**N.B.:** both won't occur in the same ECG either early or late



Early



Late

ما التفسير  
 بيانوا  
 مع جفن  
 أبدأ  
 ال ST  
 ال  
 لازم

لازم تفرقها

**DD.:** between pericarditis & ischaemia by:

- { Pericarditis; in all leads
- { Ischaemia: topography

**Incidence:** rare

**Type:** complete ECG

**Q.:**

**Reading:**

comment on T wave

(e.g. Inverted T in All Leads)

**Diagnosis:**

Causes of pericarditis: e.g. rheumatic, TB, viral

صفات الأمور

## DIGITALIS

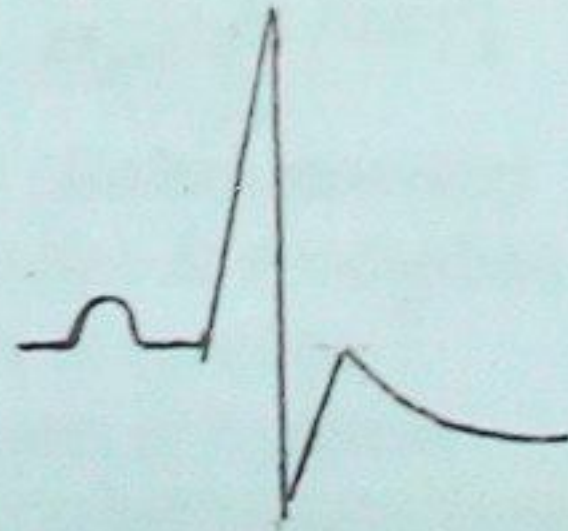
ده اللي علينا **A-Effect**

**Waves & leads:** ST segment in all leads

نادر جدا

**Change:** -Depressed sagging ST segment = "Depressed e Iso-Electrical"  
 ± Inverted T wave ST segment

ويشترط  
 Complete ECG



**D.D. from Ischemia**

في  
 All leads

Topography

ECG مس **B-Toxicity:**  
 Any Arrhythmias



## Etiology:

تعدل آف  
Arrhythmia

### Cardiac (general):

IHD

Myocardial:

- Myocarditis
- Cardiomyopathy

Iatrogenic:

- Digitalis
- Anti-arrhythmic drugs (Pro-Arrhythmic Effect)

للمين

### Cardiac (special):

Valvular:

MS → AF

AS → (complete heart block)

Congenital:

ASD → RBBB

Pericardium:

Constrictive pericarditis → AF

Mitral Prolapse

Supraventricular Tachycardia

### Extracardiac:

Trivial: tea, coffee, smoking, irritable colon → extrasystole

Thyroid: thyrotoxicosis → AF

Electrolytes: hypokalemia (↓K) → vent. tachycardia

## Diagnosis of Arrhythmia:

H/O

### Symptoms:

- 1 Asymptomatic: المعظم
- 2 Symptoms: palpitation
- 3 Complications:
  - Thromboembolism (AF)
  - Angina (tachycardia)
  - Heart failure → if pt. was Border line (COPD) ⇒ Precipitate HF

Exam. Signs: = زيا قلبه

Pulse:

Neck veins:

Auscultation

أعظم حاجة

### Investigations:

#### A- Detect arrhythmia: ECG

Resting ECG:

Exercise ECG

Ambulatory ECG (Holter monitor)

- DD. between cardiac & noncardiac cause of a symptom such as: palpitation, pain & syncope.
- Detect & document arrhythmia

B- Mechanism of arrhythmia: electrophysiological study (EPS) via Rh. sided Catheter

C- Cause of Arrhythmia: Echo & Doppler



شفوي عيان Rheumatic Valve  
بشأجه ← لفتة جاله HF

أيه تفسيرك؟!

1- Activity "السبب الأشهر في مصر"

2- Arrhythmia

3- Infective Endocarditis

4- Chest Infections



3

## Management of arrhythmia:

لا تعطل حركته

**Mild arrhythmia:** treatment of the <sup>①</sup>cause only  
e.g.: cessation of tea, coffee & smoking in cases of extrasystole  
Treatment of rheumatic carditis in case of 1<sup>st</sup> degree heart block

تعطل حركته

**Moderate:** treatment (stop) of arrhythmia & <sup>②</sup>treatment of the cause  
e.g.: in cases of ventricular tachycardia treat tachycardia & its causes

**Complications:** treatment (stop) of arrhythmia, <sup>②</sup>its cause & <sup>③</sup>its complications  
in cases of rapid AF treat AF, treat the cause & give anticoagulant

## How to treat (stop) arrhythmia: [Moderate Arrhythmia & Complication]

أنفعل وبيلا إذا نفعت

### A- Simple measures:

**Vagal maneuver:** in cases of supraventricular arrhythmia

- Carotid massage
- Induction of vomiting
- Pressure on eye ball

**B- Pharmacological treatment:** the patient is haemodynamic stable

**Classification of antiarrhythmic drugs:**

Classification of Actions  
مالية علاقة أبدأ بيمين  
في العلاج

- Class I: Na channel blocker (e.g. Quinidine, Lidocaine)
- Class II: Beta blocker (e.g., Indral)
- Class III: K channel blocker (e.g. Bretylium)
- Class IV: Ca channel blocker (e.g. verapamil)

شفوي - أي الفرق بين  
classification  
وال stepped  
care programme

### C- Non pharmacological:

Pacemaker

Ablation of focus

DC shock: Direct current

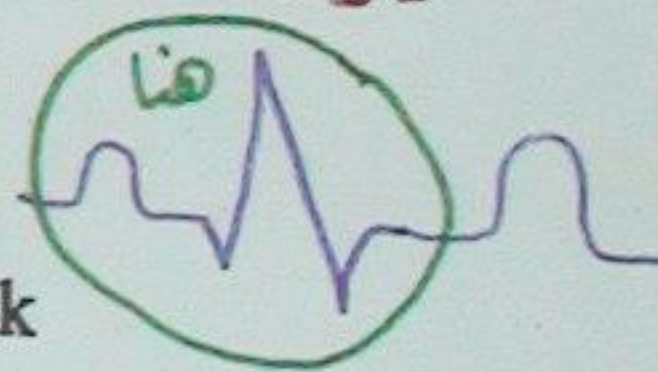
شفوي - أمي أدس DC shock

- If the patient is haemodynamically unstable  
Haemodynamic stability is determined by: BP, urine output, mentality

Conditions: for elective DC shock (to stop arrhythmia)

- 1- Stop digitalis before application of DC shock → DC & Digitalis ⇒ العيان يوت
- 2- General anesthesia "short term"
- 3- Synchronization (electricity delivered in a certain phase of ECG)
- 4- Begin with small Joules then increase

These conditions are NOT applicable in case of Emergency DC shock for cardiac arrest



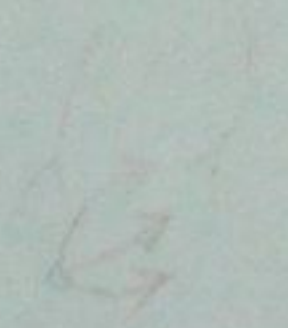
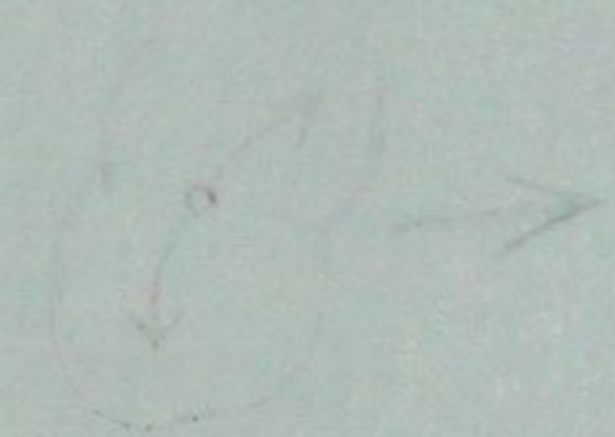
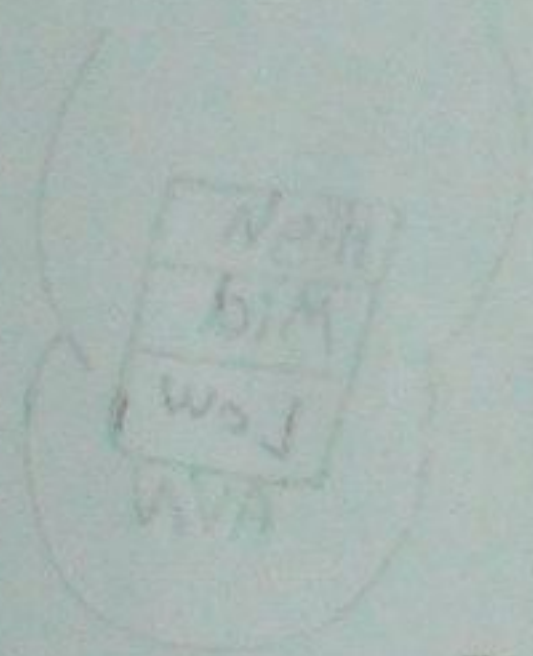
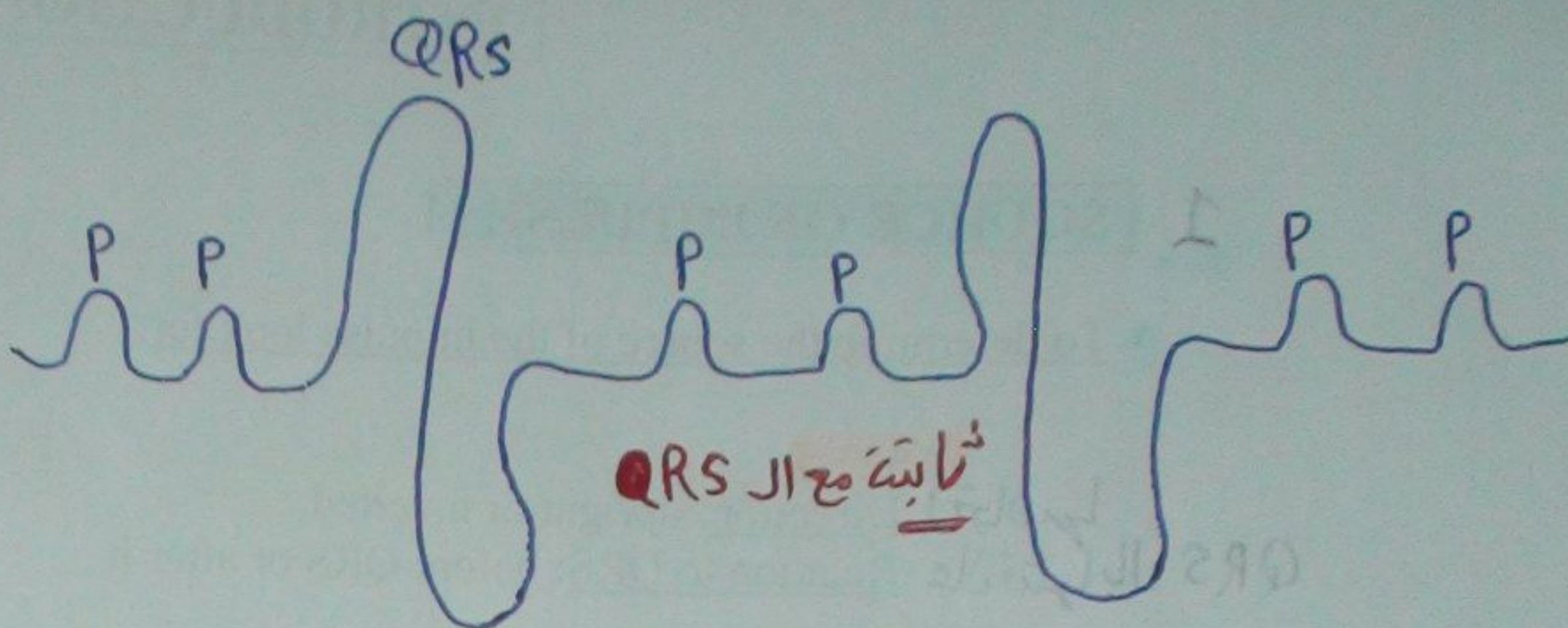
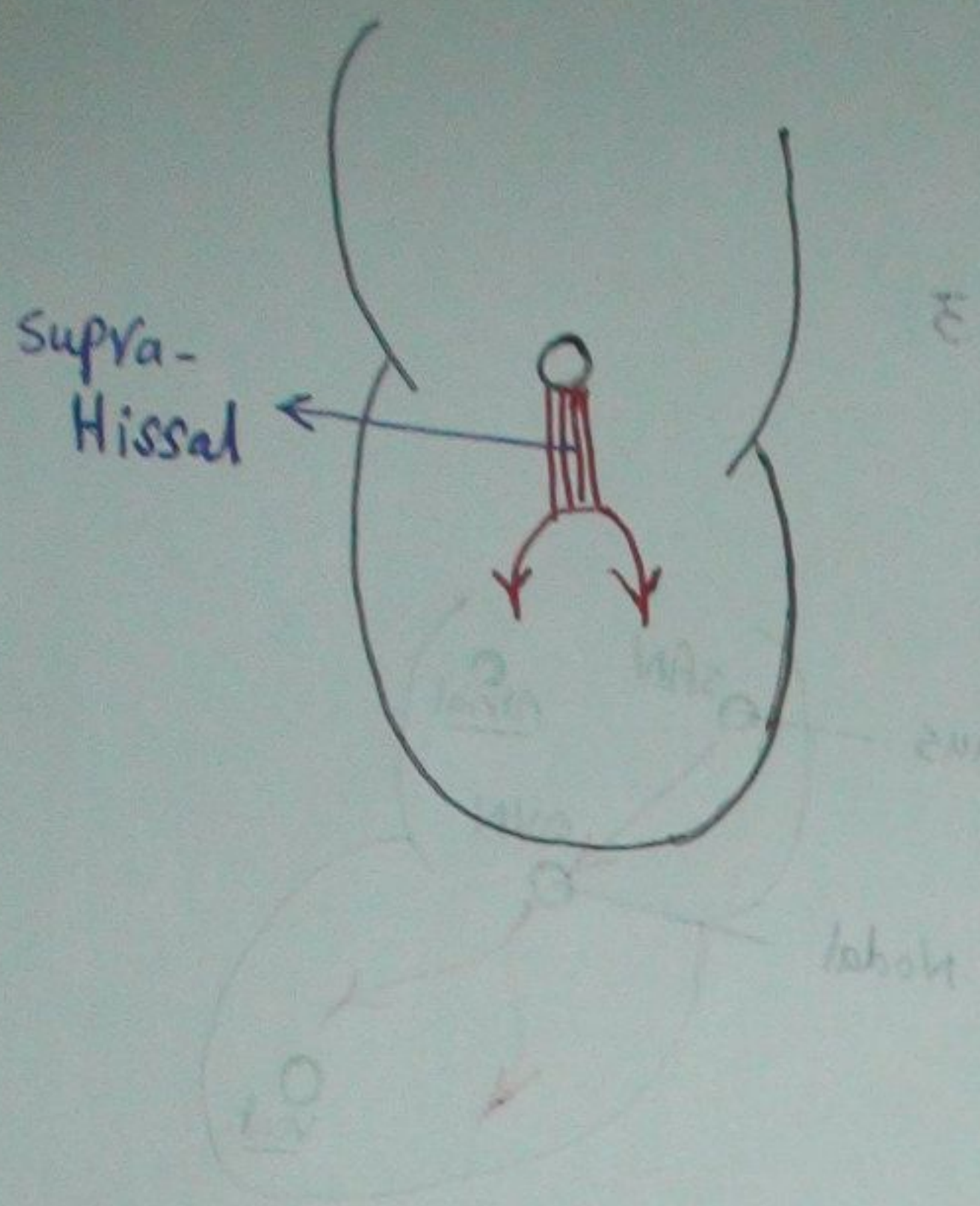
N.B. كل مرة بأدس DC shock

جته من القلب بيقوت

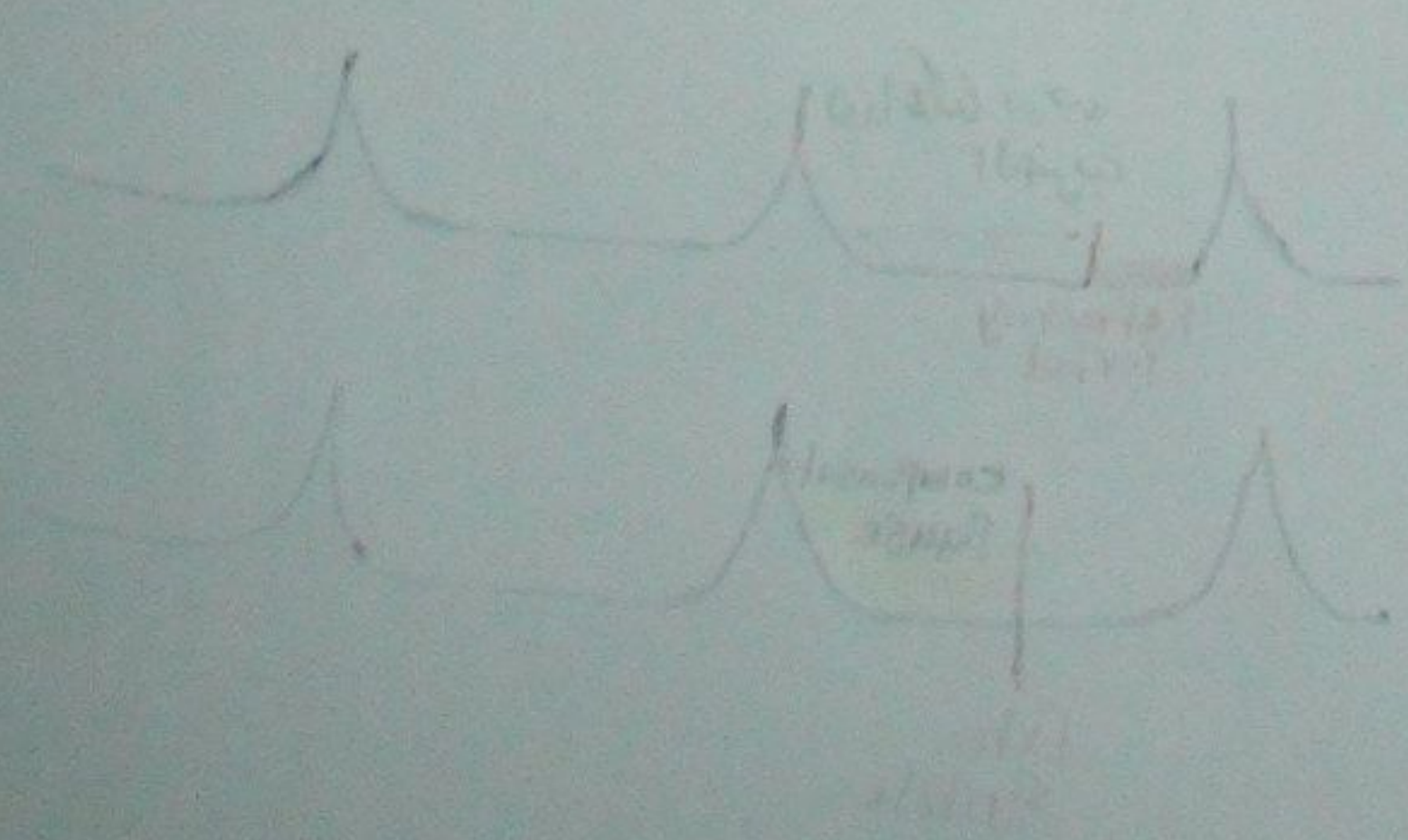
\* وحدة قياس الكهرباء = Joules



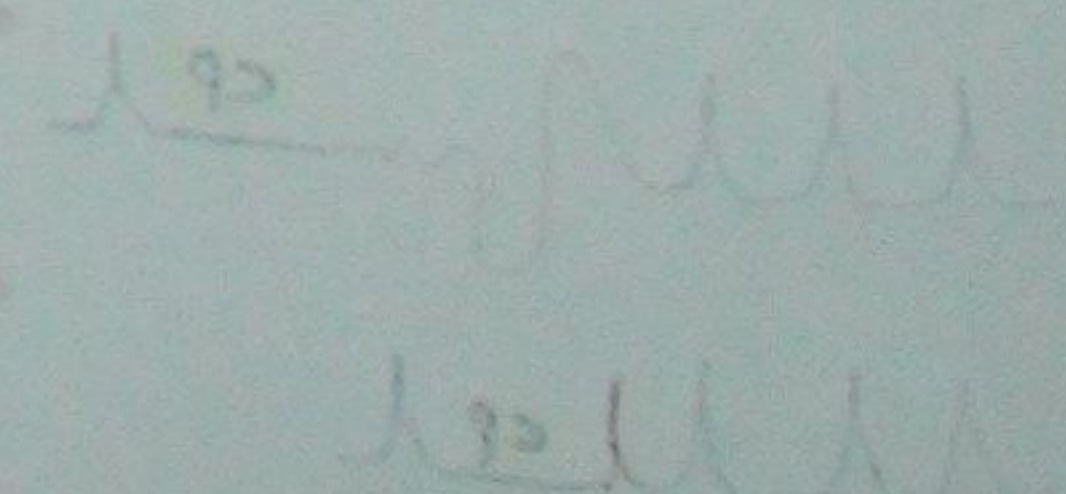
# Supra-Hissal-Block = 3 AVB في نوع من ال



[SA node]



• Supra-Hissal block  
• AVB



• Supra-Hissal block  
• AVB



Three (3) degrees:

- 1AVB: all beats from SAN will pass to ventricle but they are delayed
- 3AVB: all beats will NOT pass to ventricle
- 2AVB: some beats will pass, others will not

**1AVB:**

PR interval: fixed prolonged  
(DD: normal ECG)

**3AVB = complete heart block = Atrio-Ventricular Dissociation**

All beats will not pass, so a focus from the ventricle will beat

Regular rhythm

Slow rate (30-40/min)

± Multiple (NON fixed) P waves between each 2 QRS

QRS: either → "Broad Bizarre"  
→ "Narrow Normal"

P/QRS  
صالحه وعضن علاقة  
بيعضن  
(Idio-Ventricular)  
Rhythm

**2AVB:**

Some beats will pass, others will not in either:

بدون نظام Irregular way → variable block: irregular ventricle

بنظام Regular way → fixed block: regular ventricle (e.g. 2:1, 3:1)

**Variable block:**

Irregular

Wide space, look for the distance between previous 2 beats... normal  
(DD: supraventricular extrasystole)

**Classification of 2AVB:**

Type 1 = Wenckebach = Möbitz I

Progressive prolongation of P-R interval with each succeeding beat until one P wave occurs without a QRS (i.e. there is a dropped beat)

Type 2 = Möbitz II

Dropped beats with fixed P-R intervals

**Fixed block: (2:1, 3:1, 4:1)**

Regular, bradycardia

P wave: multiple (FIXED) P waves between each 2 QRS

QRS: narrow, normal (passing in the normal pathway)

Fixed, 2AVB, 3:1



# ع ك Arrhythmia في ٣ ثنائيات

- تشخيصياً } ECG ال  
Character  
Mechanism

- الاختبار } Incidence  
الحدوث الذي ينتج بسبب

- Qs } قراءه ال ECG  
نظري  
تشخيصك أيه؟  
أيه ال حمل؟  
و حمل ليه؟

## • The Most Common 3 ECGs in Exam

1- A.F.

2- Atrial Flutter

3- Vent. Extra-systole



# IRREGULAR ARRHYTHMIAS

## 1- ATRIAL FIBRILLATION (AF)

### Physiological bases:

Atrium discharge impulses at a high rate (600/min)  
Due to irregular AVN block, there will be irregular ventricular rate

Atrium  $\rightarrow$  Variable AVN Block  $\rightarrow$  AF

### ECG criteria:

Rhythm: irregular  
P wave: absent  $\pm$  replaced by fibrillation (f) waves  
QRS: narrow, normal (pass in the normal pathway)

Lead II  $\rightarrow$  P wave  $\rightarrow$  f small

### Incidence: very common

### Type of ECG: rhythm strip, $\pm$ complete ECG

Q:

#### Reading:

Comment on rhythm: irregular  
Determine rate: 300/

Comment: Absent P wave  
 $\pm$  Replaced by fibrillatory waves

#### Diagnosis:

##### Causes of AF:

- 1- MS
- 2- Thyrotoxicosis
- 3- General cardiac causes of arrhythmia (Ischemia)

##### Causes of slow AF:

With digitalis treatment  
Lone AF (in old age)  
AF with heart block

#### Treatment:

- Recent AF: restore sinus rhythm by Cardio-Versions
- Old AF: decrease ventricular response by Digitalis

Core-Vert  
Ibutilide  $\leftarrow$  class I  
Quinidine  $\leftarrow$  class III

## 2- VENTRICULAR EXTRASYSTOLE

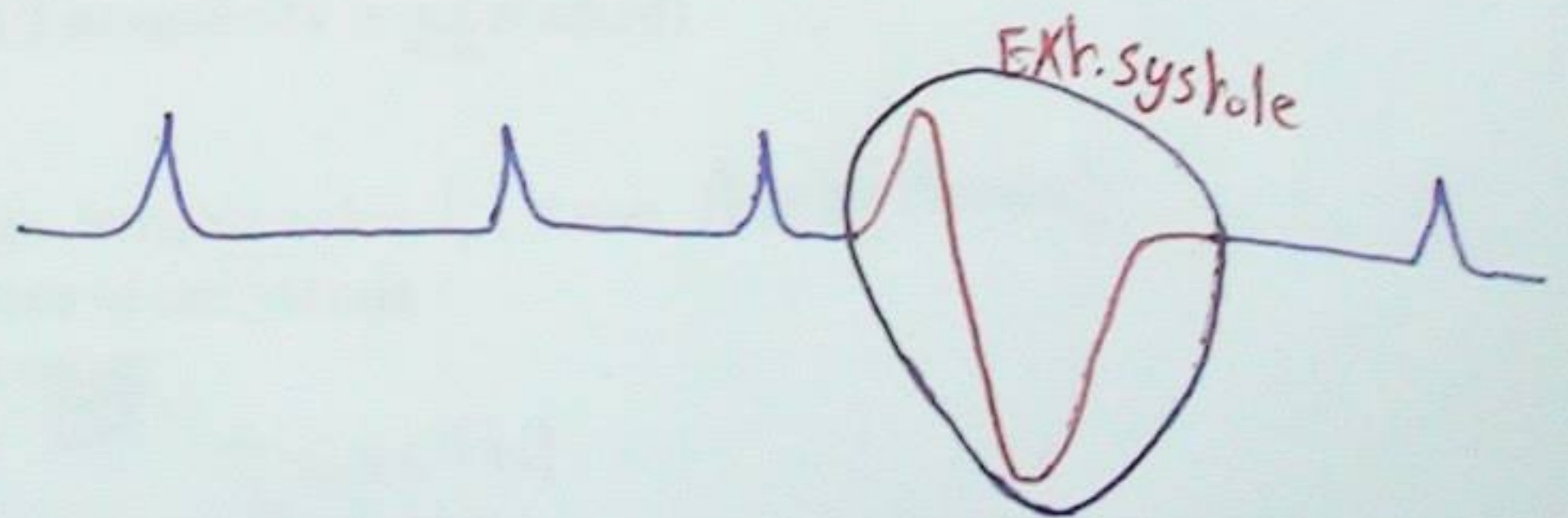
### Physiological basis: ventricular ectopic focus

### ECG criteria:

Normal beat, then ventricular premature beat then a compensatory pause  
QRS: Broad bizarre

### Incidence: very common

### Type: part of complete ECG





# ARRHYTHMIAS

## INTRODUCTION

3

### 1 SOURCE OF IMPULSE

To determine the source of the impulse look for:

**P wave:**

Direction: upright or inverted

Relation to QRS: before QRS or after it

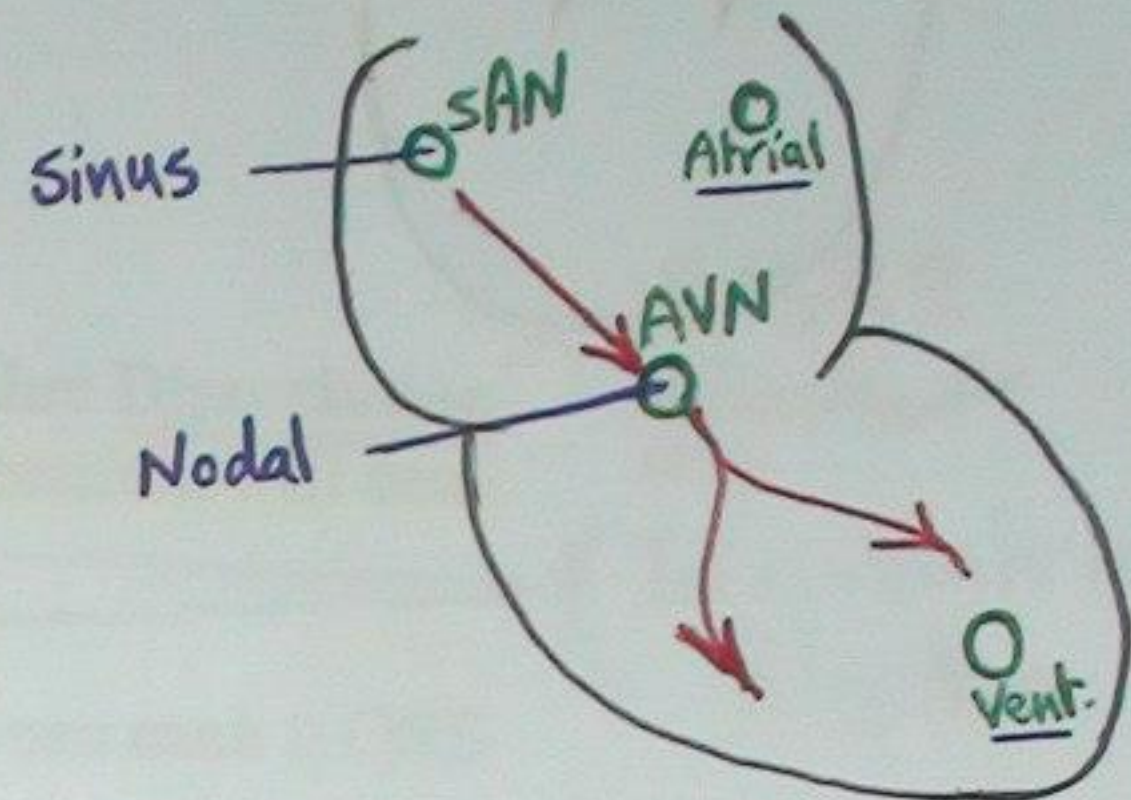
اتجاهها  
علاقته بال QRS

**QRS:**

Width: narrow or broad (wide)

Shape: normal or bizarre

اتساعها  
شكلها



Supraventricular rhythms:

Sinus rhythm: SAN

QRS: narrow normal

P wave: upright before each QRS

الكهرباء... ما شية زار  
في نفس الوقت

الكهرباء... بدأت زار  
قبل ال Ventricle

Junctional = Nodal rhythm: AVN

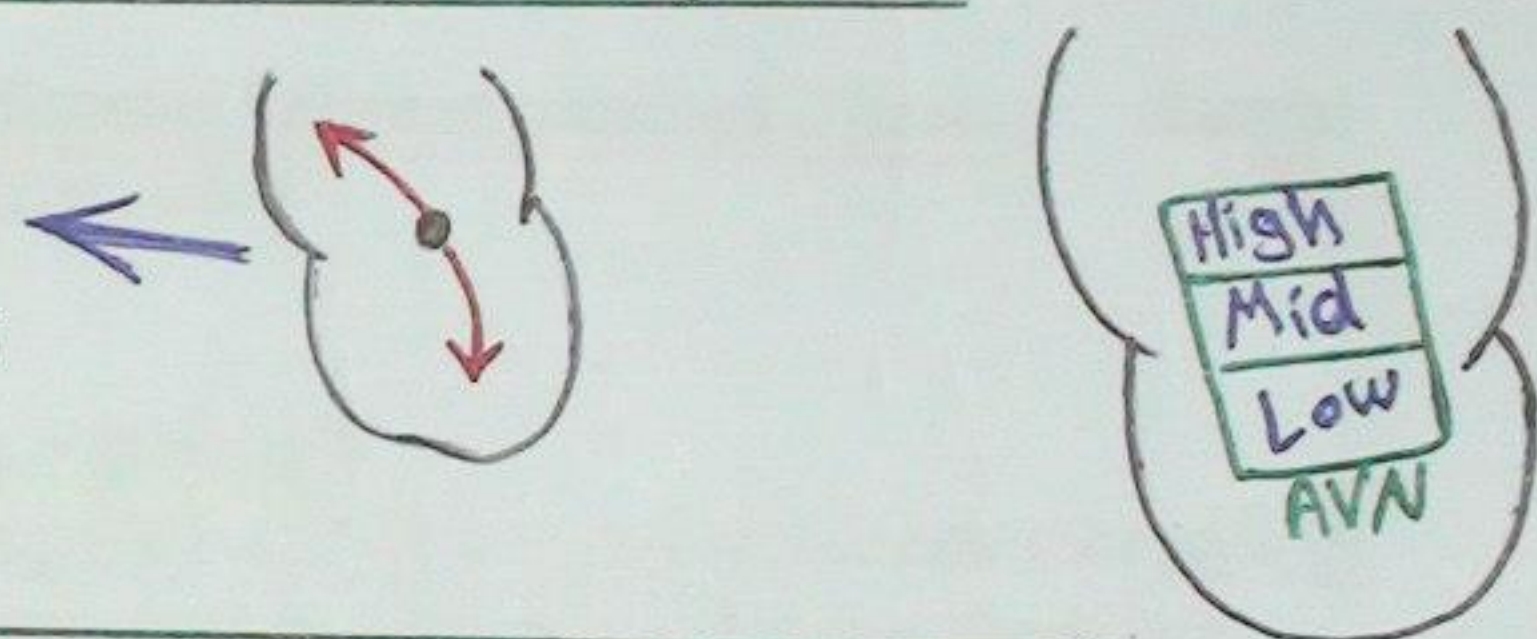
QRS: narrow normal

P wave: inverted

High nodal: P before QRS

Low nodal: P after QRS

Mid nodal: absent P



Ventricular beat: P لا تفرقه  
أيا كانت

QRS: wide & bizarre

كل Vent. بغيرها مع بعضه

ده مسار غريب  
الكهرباء

ESCAPE RHYTHM:

وقف SAN  
حاجة ثانية شغالة  
فيها

### 2 EXTRASYSTOLE

شغور هام

- It is due to an **ectopic focus** initiating a premature (earlier) beat
- After it there is a refractory period in which the SAN can't initiate another beat, so there is a **compensatory pause** (CP)

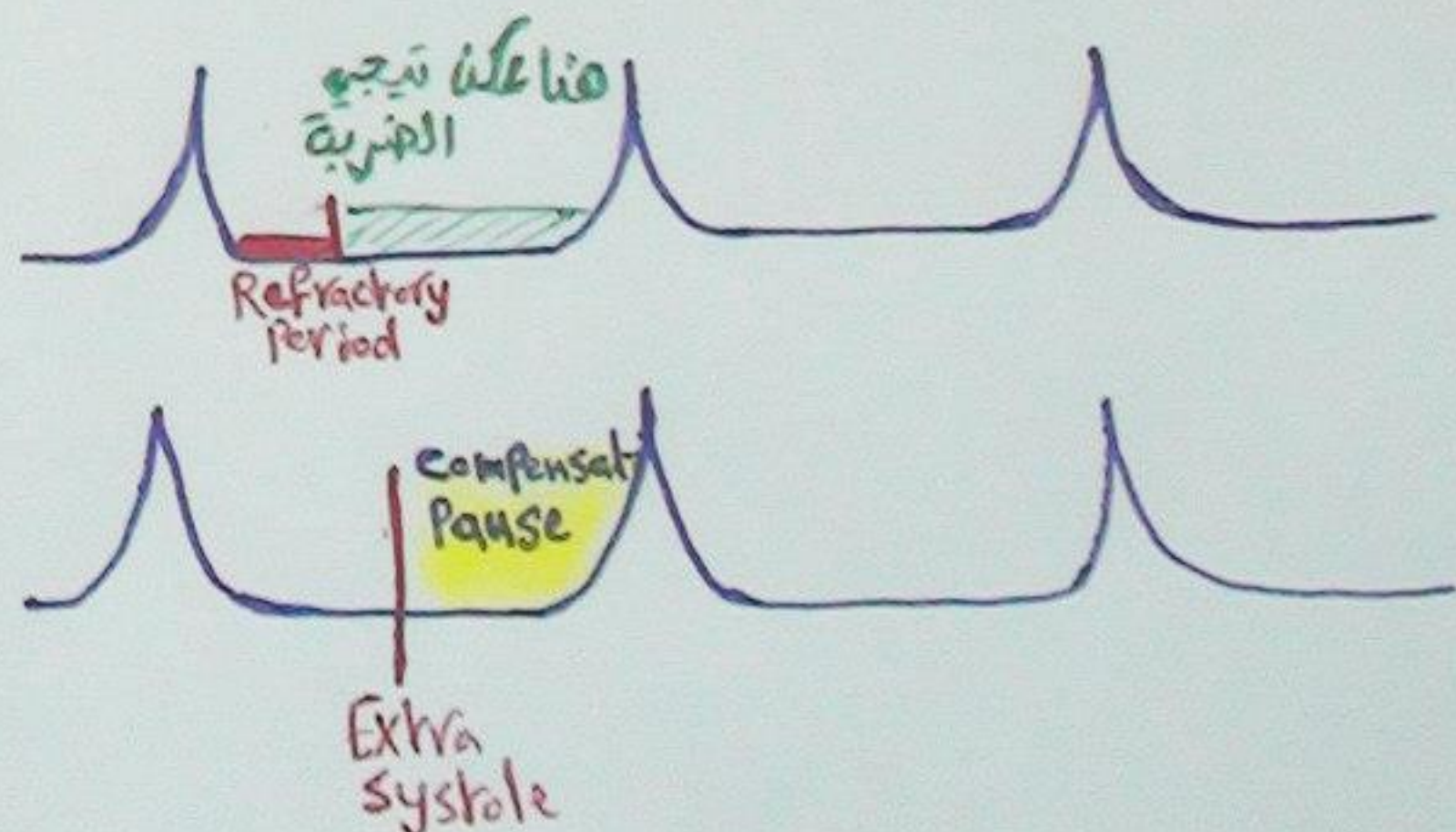
Ectopic focus:

Ventricular: مسار الكهرباء غريب

QRS: broad & bizarre

Supraventricular: مشيت في ال ر العادة

QRS: narrow normal



أولاً لما نشوف فراغ ← أرجح شوف الـ P بين الـ QRS  
والعلاقة ما بينهم  
هل هما "من نفسين"؟

18

قانون

عشان تفرقه ما بين Extra-systole وال 2 AVB  
"2nd degree Heart Block"



Q.:

Reading:

Rhythm: irregular

Rate: as regular =  $300/R-R$  (if irregularity is not marked)

Diagnosis:

Causes: Hypokalemia (1st), Ischemia (infarction early ECG change)

General cardiac causes of arrhythmia.

Criteria of malignant: PVCs in infarction:

- Multiple (more than 6/min.)
- Multifocal,
- Occurring in runs (3 or more consecutive beats)
- Showing R on T phenomenon

Treatment: (in infarction)

Benign PVCs: treatment of the cause (infarction)

Malignant PVCs: lidocaine (class I) dose..

Side Effects

Ectopic Focus  
مفترية

= Subvarieties of extrasystole: (rhythm strip)

A - Ventricular extrasystoles coming in Bigeminy (or Trigeminy)

ECG: one normal beat then one ventricular beat (extrasystole) followed by a compensatory pause and so on.

Q.: causes of bigeminy (or trigeminy):

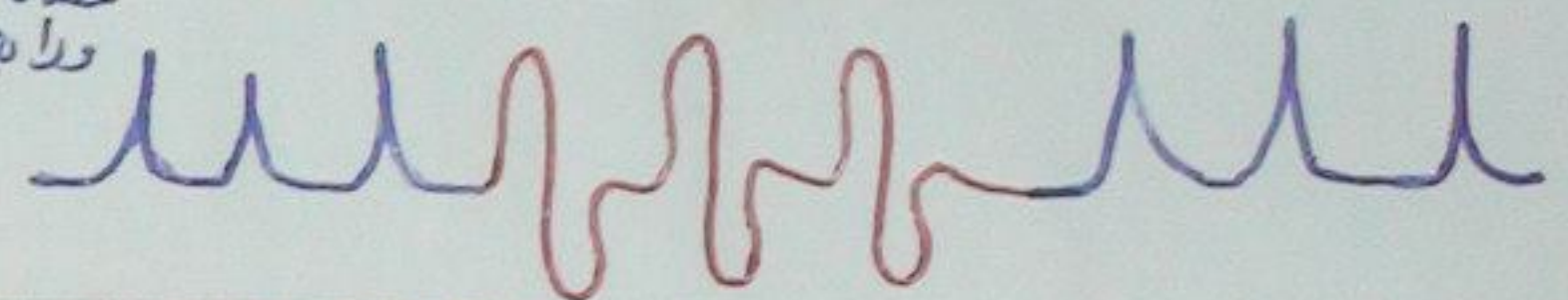
- 1- Digitalis toxicity
- 2- Hypokalaemia
- 3- Infarction

Rhythm: Irregular Irregularity

1st, Lidocaine

Vent. Extra-systole  
come in

B- Triplets = Runs = Non sustained VT



### 3- SUPRAVENTRICULAR EXTRASYSTOLE (SV. Ext.)

Physiological bases: (supraventricular ectopic focus)

ECG criteria:

Normal beat, then supraventricular premature beat then a compensatory pause

QRS: narrow, normal

Wide space, look for the distance between previous 2 beats... Narrow

Incidence: occasional

Type of ECG: part of complete ECG, Rhythm strip

Q.:

Reading:

Rhythm: irregular

Rate: as regular =  $300/R-R$  (if irregularity is not marked)

Diagnosis:

Causes:

- 1- tea, coffee, cigarettes, irritable colon (Exam Arrhythmia)
- 2- general cardiac causes of arrhythmia

Treatment: treatment of the cause

إذا كان الموضع  
استأهل  
أدوية تديره  
حاجة للـ Arrhythmia



# Irregular Arrhythmias ١٦ ملحق

## ⑤ Atrial Flutter & Variable Block

(apical 20) ١٦ ملحق (١٦ ملحق) (١٦ ملحق) (١٦ ملحق) (١٦ ملحق)

١٦ ملحق ٢٠

١٦ ملحق ٢٠



(١٦ ملحق ٢٠)

١٦ ملحق ٢٠

١٦ ملحق ٢٠



\* فرقها من اليمين قبل

## 4- VARIABLE 2AVB

## Variable 2nd Degree Heart Block

Physiological bases:

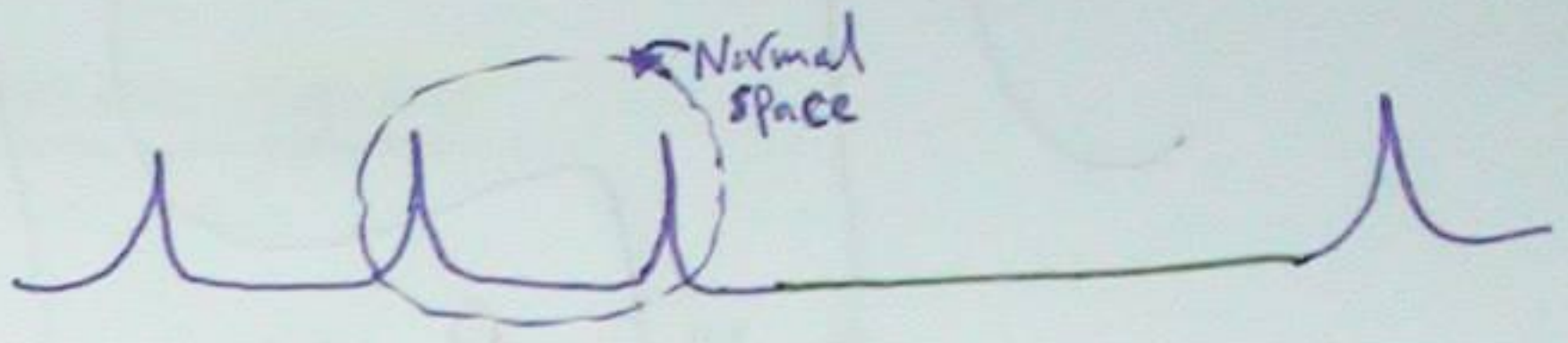
ECG criteria:

Wide space, look for the distance between the previous 2 beats .normal

DD: supraventricular extrasystole

Incidence: occasional / دلوقتى بتنزل / زمان كثير

Type of ECG: rhythm strip



Q.: diagnosis

Causes: 1- general cardiac causes of arrhythmia

ديه حاجة تافهة Treatment: of the cause

## REGULAR BRADYCARDIAS

< 60 Beat/Min

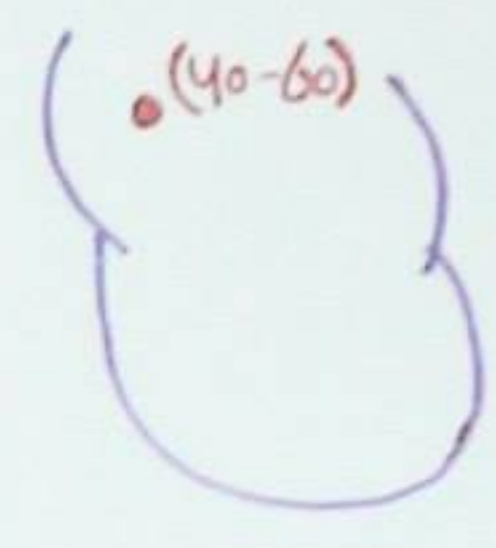
### 1- SINUS BRADYCARDIA

Physiological bases: SAN discharge at a slow rate (50-60/min)

ECG criteria: normal ECG with a slower rate

Incidence: occasional

Type of ECG: part of complete ECG (+) Rhythm strip



Q.: diagnosis

تلاشي الأسباب

Causes:

Iatrogenic: beta blockers

Pathological: myxedema

Physiological: athletes

ديه حاجة تافهة Treatment: of the cause

### 2- NODAL (JUNCTIONAL) RHYTHM:

Physiological bases:

AVN becomes the pace-maker of the heart

AVN is regular & slow (40-60/min)

ECG criteria:

Rhythm: regular

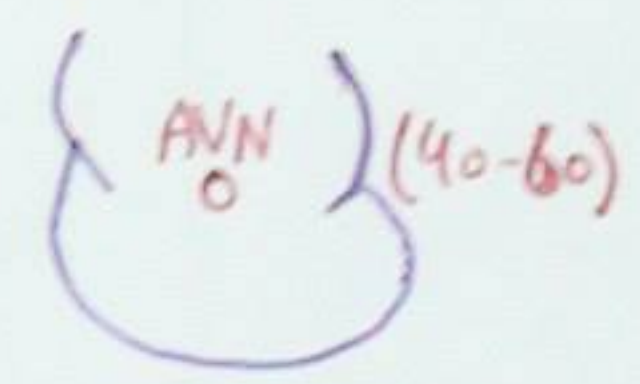
Rate: bradycardia

QRS: narrow normal

P wave: inverted, before QRS, after QRS or absent

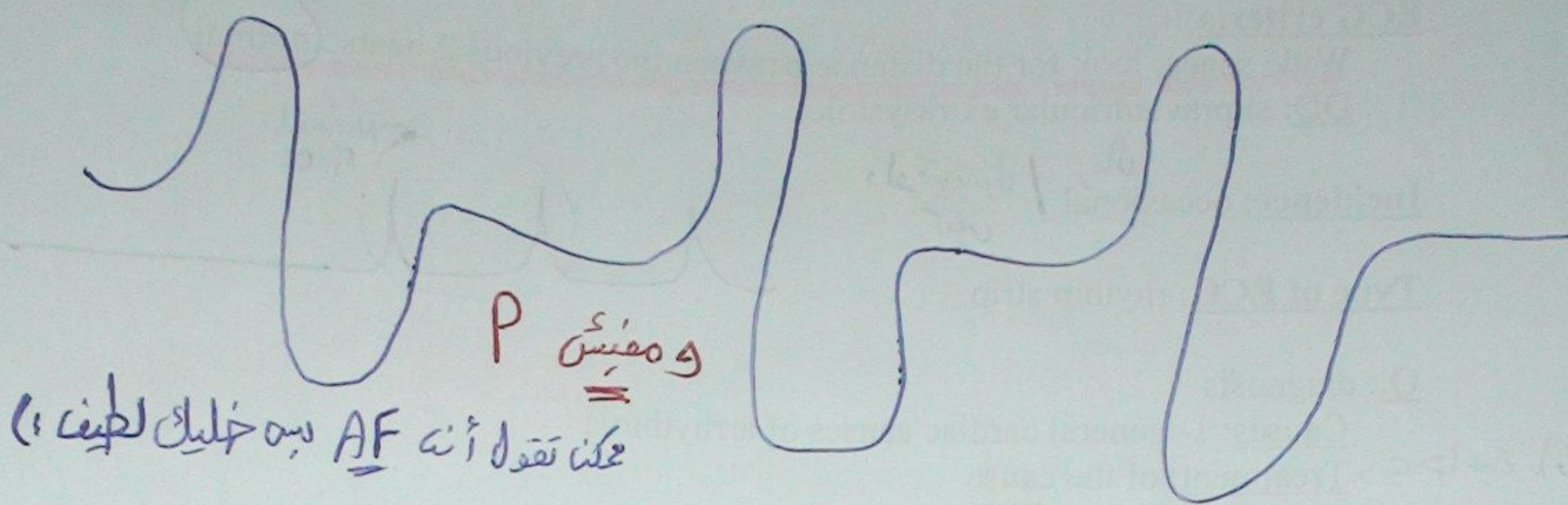
→ If absent: DD. AF (AF is irregular)

ديه اليمين بتنزل الاختيار

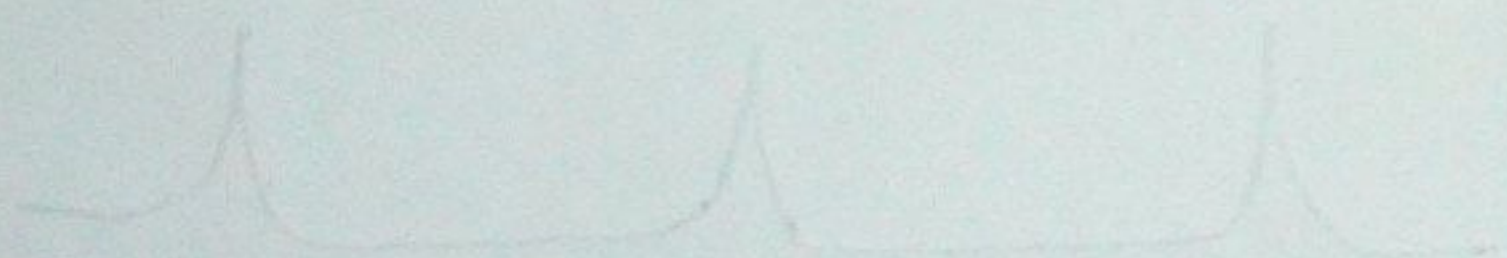
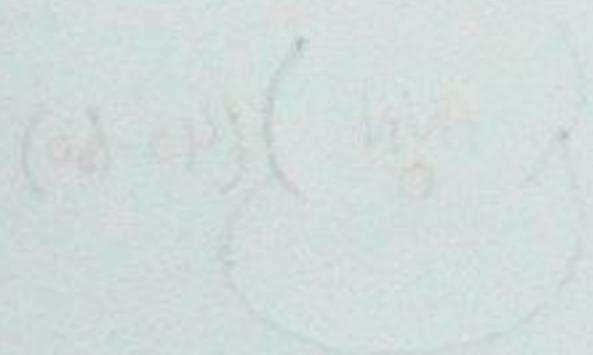
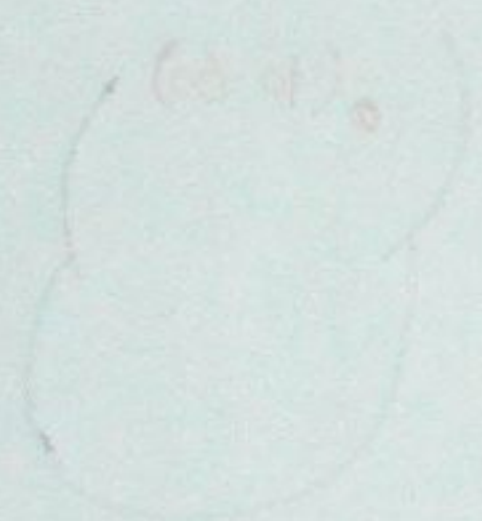




# N.B. Ventricular Escape Rhythm



< 100 beats/min





Incidence: rare

Type of ECG: rhythm strip

\* Comment on P:

P is - Inverted (Before/After)  
or - Absent

Q: diagnosis

Causes: 1- general cardiac causes of arrhythmia

Treatment:

- of the cause

- In symptomatic cases: ↑↑ heart rate: Atropine

"Low COP"

حسب العيان مدس أعرجنا ولا

### 3- FIXED 2AVB

Fixed 2nd Degree Heart Block

Physiological bases: some beats pass, others not on regular bases (3:1, 4:1)

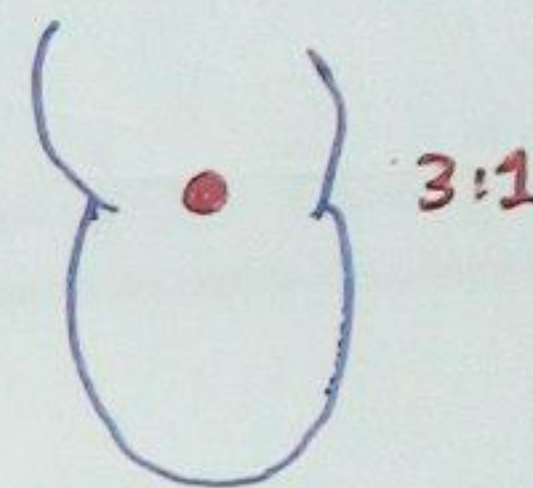
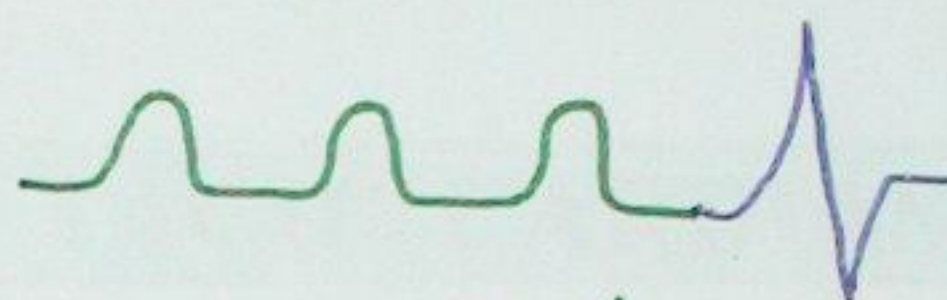
ECG criteria:

Rhythm: regular

Rate: bradycardia

QRS: narrow normal

P wave: 3:1, 4:1, 2:1



Incidence: rare

Type of ECG: rhythm strip

3:1  
Fixed 2AVB 3:1

Q:

Reading:

Determine atrial rate: 2 methods

a- Ventricular rate (300/R-R) x 2 or x 3 or x 4

b- 300/P-P interval

Diagnosis:

Causes: 1- general cardiac causes of arrhythmia

Treatment: ↑↑ heart rate: Atropine

Low COP

### 4- THIRD DEGREE AVB (3AVB)

Physiological bases:

AVN → ولا مبرية تنزل

ECG criteria:

Rhythm: regular

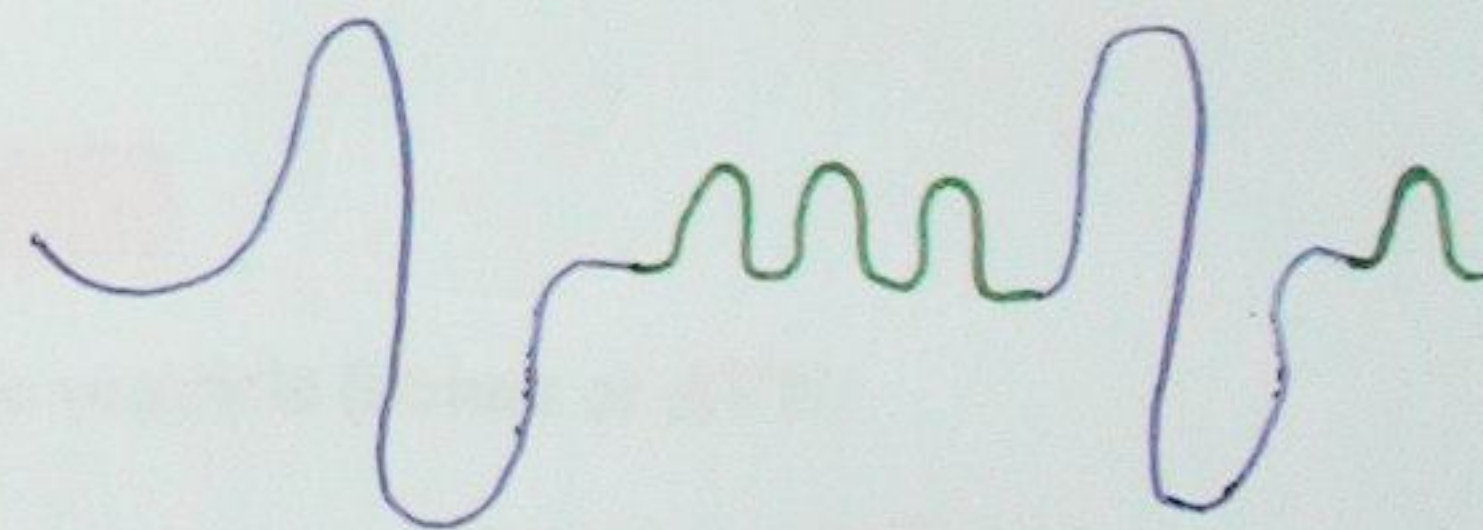
Rate: bradycardia (30-40/min)

QRS: either; → broad bizarre

→ narrow normal

(P waves: ± multiple (NON fixed) P between each 2 QRSs)

N.B.: if absent P waves → ventricular escape rhythm



Incidence: common

Type of ECG: rhythm strip



Q.:

Reading:

Determine atrial rate: only one method  
300/P-P interval

Diagnosis

Causes:

- ① general cardiac causes of arrhythmia (Ischemia)
- 2- congenital complete heart block
- 2- calcified AS

فام Presentation:

Low CO

(Adam Stocks attacks) إغماء as Idio-Ventricular Rhythm

Treatment:

Artificial pace-maker

← لغاية ما يجيبه If no pace-maker: ↑↑ heart rate:  
(Sympathomimetics) adrenaline, dopamine, isoprenaline  
(Never by atropine, as ventricle is not supplied by vagus)

بعضها بمنزلة  
نمكنا بوقت  
آه لحظة  
وإذا ما رجس  
عوت

## REGULAR TACHYCARDIAS

> 100 Beat/Min.

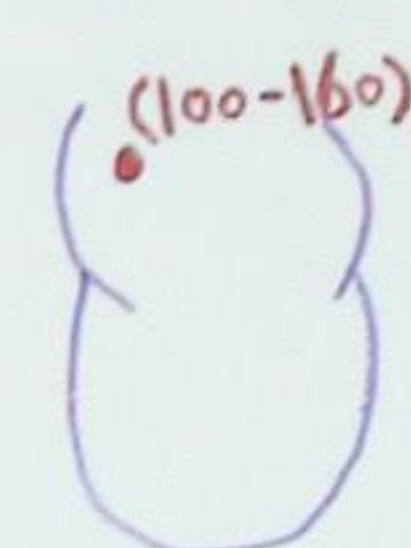
### 1- SINUS TACHYCARDIA

Physiological bases: SAN discharge at a higher rate (100-160/min) <sup>خبرها</sup>

ECG criteria: normal ECG with a higher rate

Incidence: occasional / Common

Type of ECG: part of complete ECG <sup>لا تقرأ عافى</sup>



Q.: diagnosis

تلائي الأسباب Causes:

Iatrogenic: atropine, sympathomimetic

Pathological: thyrotoxicosis

Physiological: exercise

دع حاجة تافهة Treatment: of the cause

### 2- SUPRAVENTRICULAR TACHYCARDIA

Physiological bases: tachyarrhythmia originating above ventricle (atrium or AVN)

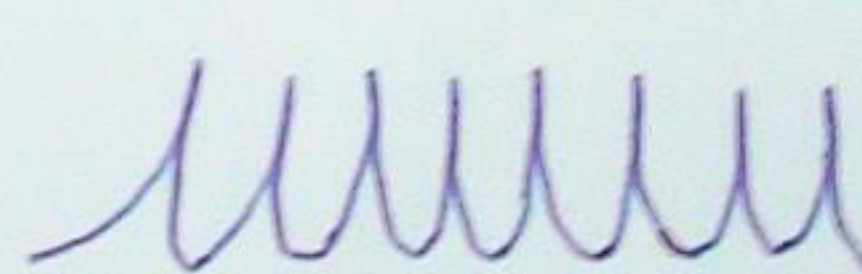
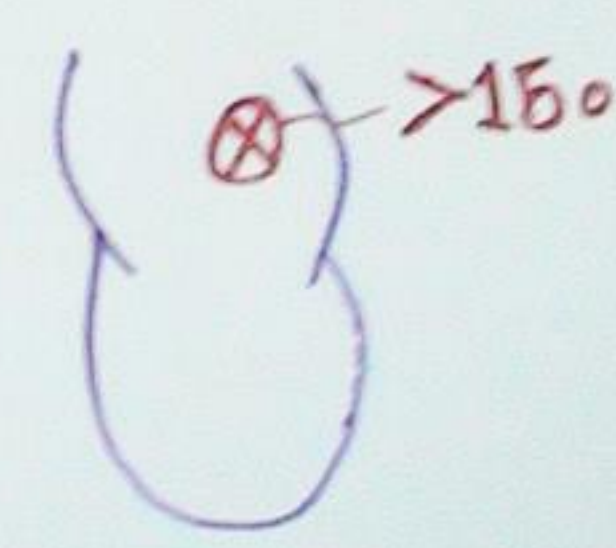
ECG criteria:

Rhythm: regular

Rate: >160/min <sup>ماروغ</sup>

QRS: narrow normal

P wave: mostly absent (may be present)  
عابا =





Supra Vent. Tachy-  
cardia

N.B.  
زمان

○ P کانوا بیشتر لوها د



Rate فرقہ ہال

So, D.D. it from

"Sinus Tachy cardia"

عمرہ ما بعدی

ال 160



Incidence: common

Type of ECG: rhythm strip (+) Part of Complete ECG

Q.:

Reading:

Q. Determine rate  $\approx$  هاتنا بالتقريب

Diagnosis:

Causes:

- ① general cardiac causes of arrhythmia
- ② MVP
- ③ WPW

Treatment: according إهم، أكثر دواء شفعي

- Conscious  $\rightarrow$  Assess pt
- Bl. Pr.  $\rightarrow$  Hemodynamic state
- Urine output

Stable: verapamil (class IV) 5-20 mg IV

Unstable: elective D.C. shock

$\rightarrow$  Isoprin (Drug of choice)

$\rightarrow$  upto 4 ampules  $\Rightarrow$

بناظر على  
Monitor in ICU  
"Very slowly"

غالباً ده عيان  
Very stable

### 3- VENTRICULAR TACHYCARDIA (VT)

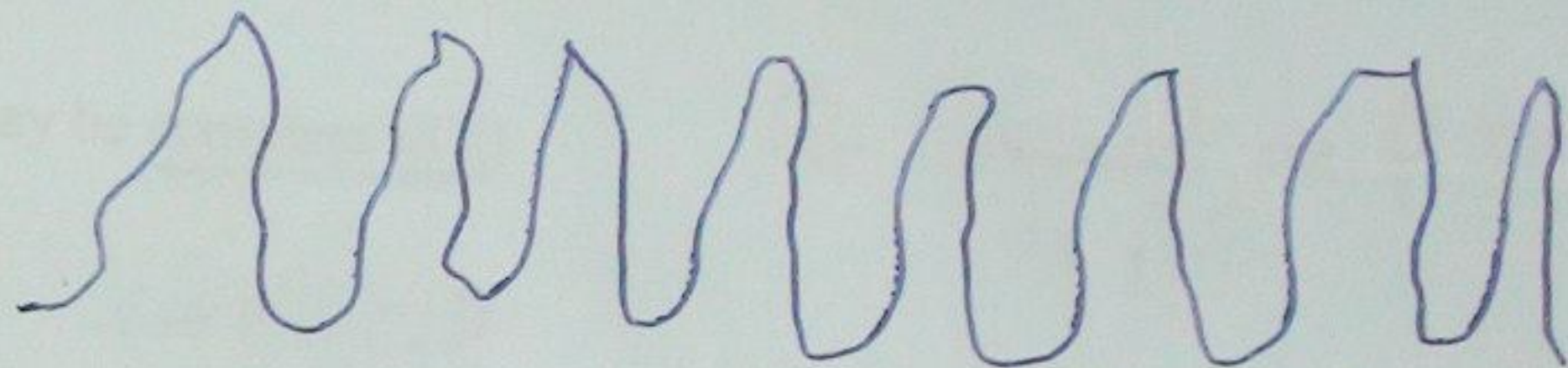
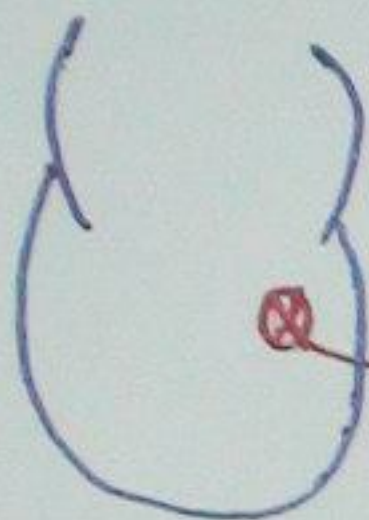
Physiological bases: rapid focus in the ventricle

ECG criteria:

Rhythm: regular

Rate: around 150/min

QRS: broad bizarre



عدّ ال Rate مع نفسك

Incidence: common

Type of ECG: rhythm strip (+) Part of Complete ECG

Q.: Diagnosis

Causes:

② Infarction

① Hypokalemia  $\rightarrow$  e case H/O: Vomiting & Diarrhea

Treatment:

Stable:

- Lidocaine:

Resistant V.T.  $\rightarrow$

If resistant: try class III (amiodarone or bretylium)

Unstable: elective DC shock

$\rightarrow$  side effect: Pulmonary Fibrosis "Irreversible"

غالباً ده عيان  
Very unstable



سفره  
فام  
تحريره

# 4- ATRIAL FLUTTER

ترعشة

- يقدر ينزل ؛
- Regular Tachy-
  - Regular Normal
  - Irregular

## Physiological bases:

Atrium discharge at a higher rate (250-350/min)  
AVN block transmitting only 2:1, 3:1, 4:1 of atrial impulses

Tachycardia مع 2:1 & 3:1 → tachycardia  
4:1 → normal rate



Comment → Atrial Flutter  
e Fixed Block 4:1

## ECG criteria:

- Rhythm: regular
- Rate: tachycardia (or normal)
- QRS: narrow normal
- P wave: absent (replaced by Flutter (F) waves)
- F wave: (saw-tooth) multiple, small before each QRS
- No T wave

F capital

## Incidence: common

Type of ECG: rhythm strip, may be complete ECG

Q. Comment on P ?  
as A-F.

Q.:

- Reading: Determine atrial rate
- Diagnosis:

لازم يطلع بين  
ال Range  
(250-350)

Causes:

- MS < Atrial Flutter
- General cardiac causes of arrhythmia

Q. متى قادر أدوية Digitalis أو Verapamil

## Treatment:

Stable: Digitalis → AF → stop digitalis → sinus rhythm  
Unstable: DC shock

وإذا حاجت  
العلاج  
Monitor

N.B.: atrial flutter with variable block → irregular rhythm

سفره  
فام  
تحريره



Atrial Flutter  
e Variable Block



# NORMAL RATE

## 1- ATRIAL FLUTTER WITH 4:1

Atrial flutter:

Regular: - Tachycardia

- Normal rate

Irregular heart

## 2- FIRST DEGREE AVB (1AVB)

Physiological bases: AV transmit all impulses but delayed

ECG criteria:

Normal ECG with fixed prolonged P-R interval (>5 small squares)

Incidence: rare

Type of ECG: part of complete ECG → Inferior MI مشهوره مع ال Inferior Infarction

Q:

Reading:

Q: Comment on P-R interval

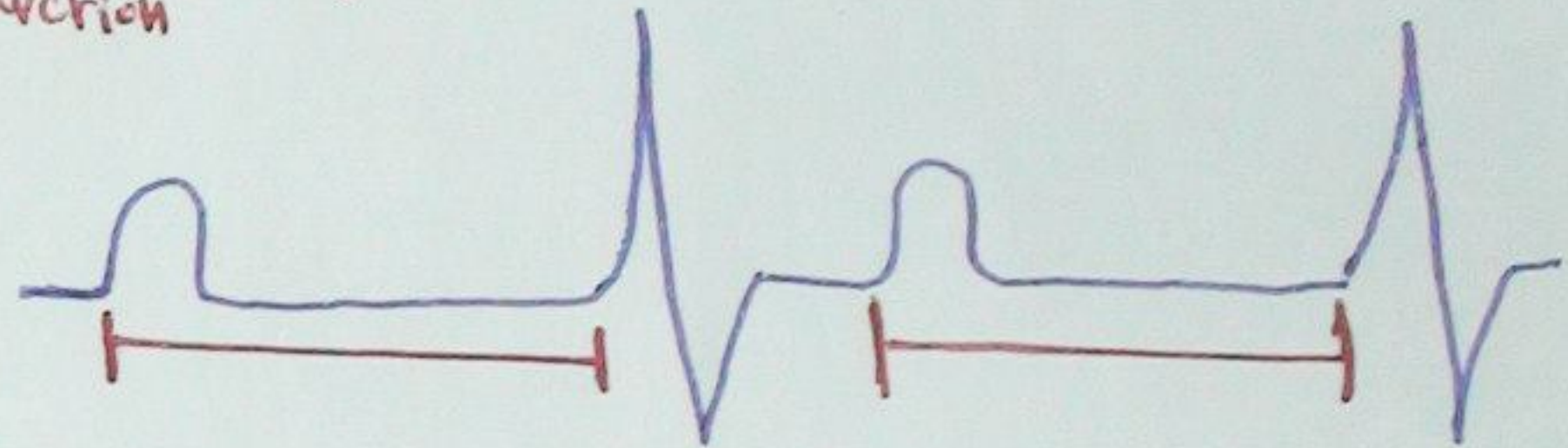
Diagnosis:

Causes:

① Rheumatic carditis <sup>fever</sup>

2- General cardiac causes of arrhythmia (infarction specially inferior)

Treatment: of the cause



بعض اوقات اذا عاين في شش

Minor criteria  
Edema in JVP  
Bundles

N.B.: It may be associated with sinus bradycardia

→ Diagnosis in this case: 1AVB with sinus bradycardia

بعض اوقات  
عشان يساعدين  
ويوضحين



# SCHEME FOR RHYTHM STRIP

المسافة ما بين R-R غير منتظمة

Irregular

Check QRS

Narrow normal

أحلت (Broad bizarre)

Check P wave

بين كل ضربتين

Ventricular extrasystole

N.B. - vent. Bigeminy  
- vent. triplet

راجع نفس لا تكون ماضية بنظام معين

Absent

Multiple (F waves) → P موجات أصلاً

Single

AF

Atrial flutter  
With variable block

Supraventricular  
extrasystole

Variable 2:1 AVB  
(check P-R interval)

Progressive prolongation → Mobits 1  
Fixed → Mobits 2

مسافة كبيرة  
من ضربتين

مسافة كبيرة  
المسافة طبيعية



**Regular Bradycardia**  $< 60 \text{ Beat/Min.}$   
 Rate  $\frac{1000}{\text{R-R}} = \frac{300}{\text{R-R}}$

Check QRS

**Narrow normal**

**Broad bizarre**

Check P wave

**3 AVB (Infra Hiss)**

**Absent**

**Multiple**

**Single**

Check their **no & site** between each 2 QRS

**Sinus bradycardia**

**Nodal rhythm (mid)**

**Fixed**

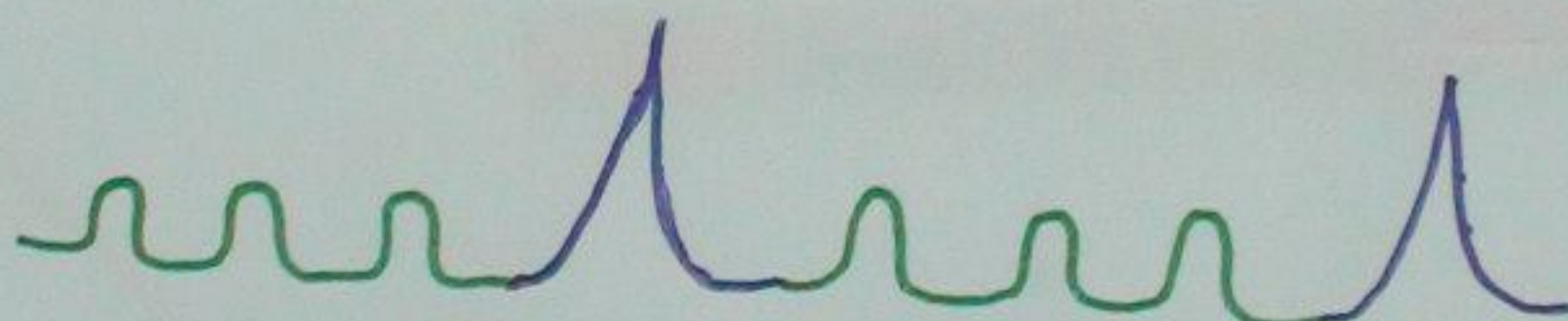
**variable**

**Fixed 2AVB**

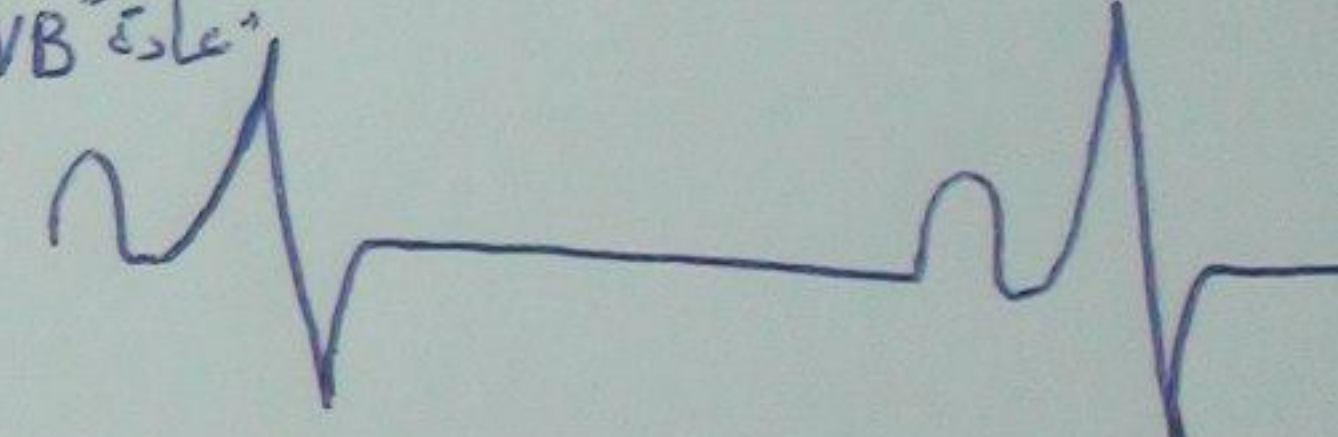
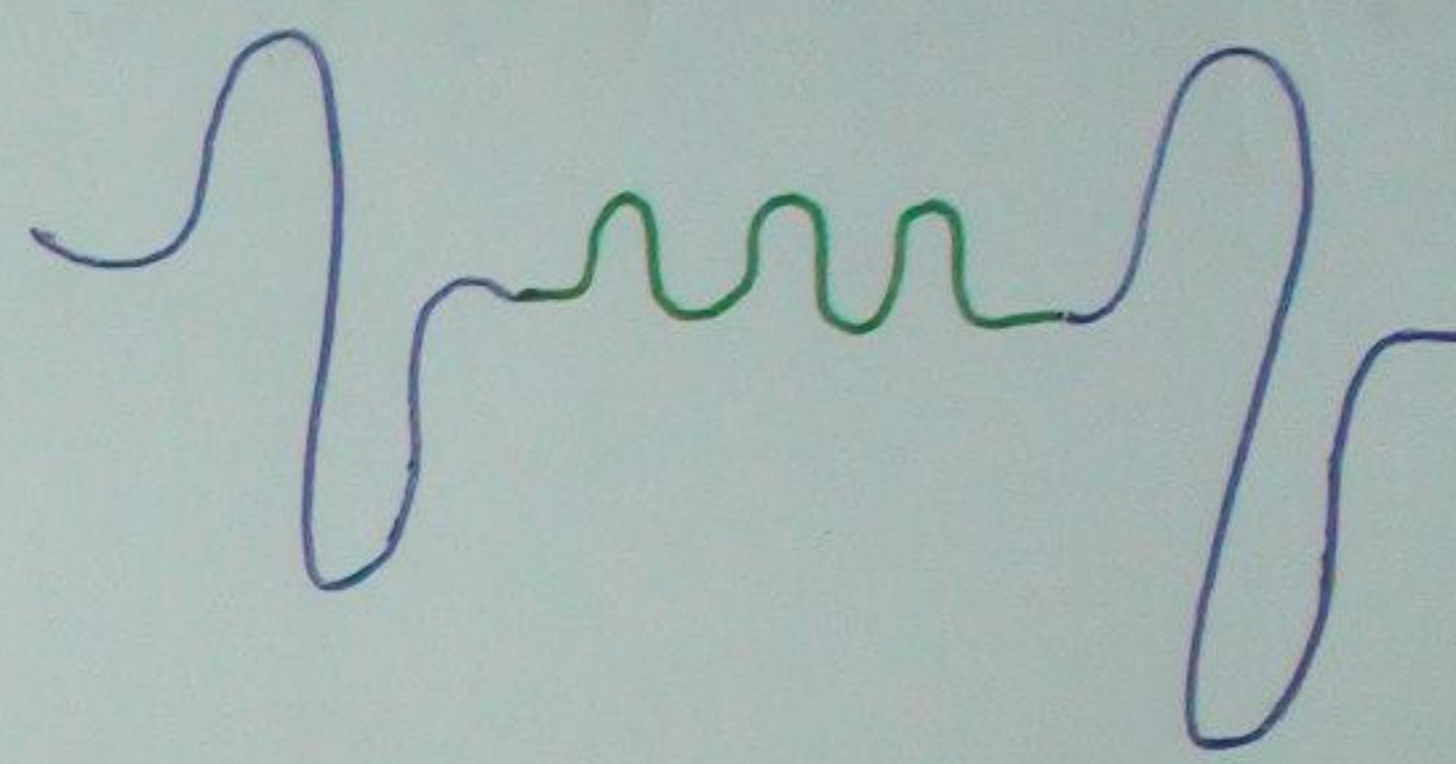
**3 AVB (Supra Hiss)**

خود بالك  
 يكون جاري معك  
 حاجة مستجيبة  
 عادة 2AVB

أنفاسا  
 أحسن



Fixed 2AVB 3:1





**Regular Tachycardia** > 100 Beat/Min.

Rate  $\frac{300}{(R-R)}$

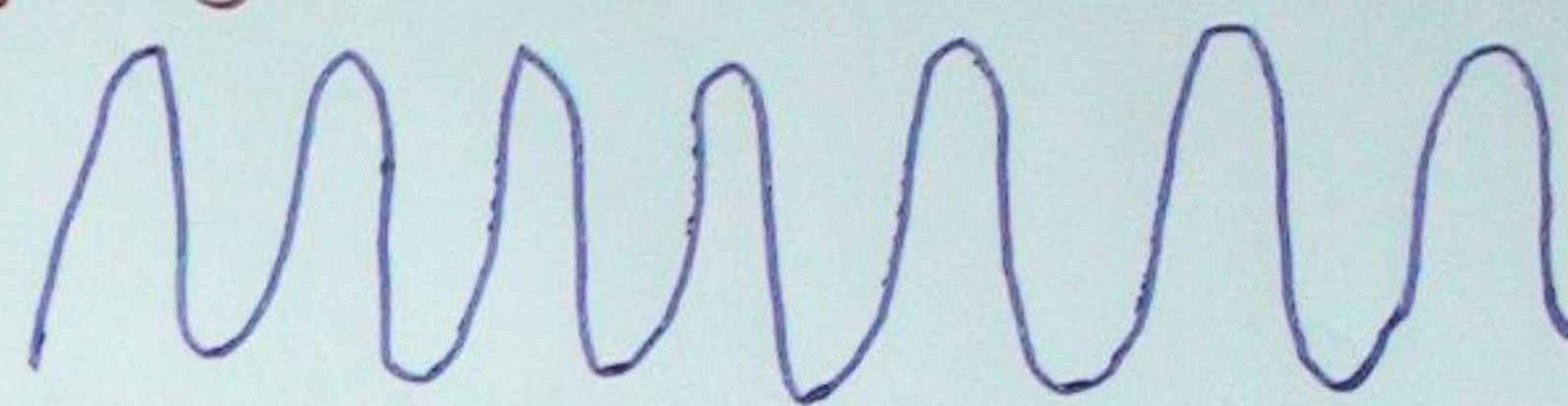
Check QRS

**Narrow normal**

**Broad bizarre**

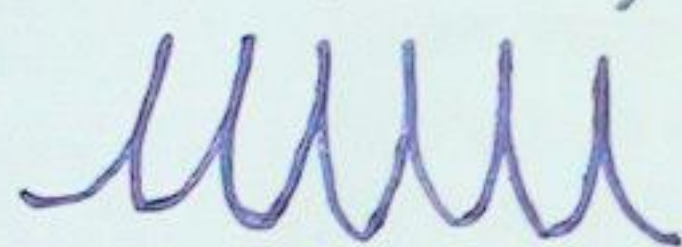
Check P wave

رعب VT



Absent لا توجد  
Multiple عدة P موجات  
Single واحدة P موجة

Supraventricular tachycardia (S.V.T.)



Atrial flutter With fixed block

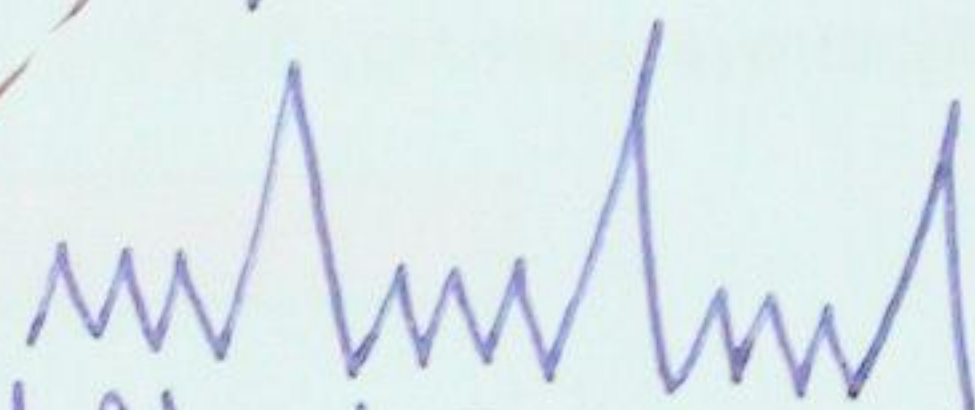
> 160

< 160

S.V.T

Sinus tachycardia

Fixed Atrial Flutter 3:2



بسرعة 4:2  
Normal Rate

Normal Rate

**Regular Normal Rate**

Atrial flutter

Fixed 4:1

1AVB

Prolonged P-R interval

Normal

Rhythm & Rate

بسرعة 4:1  
e.g. Infarction



يُمنع أن تكون Final Dx إلا بعد ما تخلص ال 5 محطات

\* اطمحنا من عيشه اجتر رطله

## SCHEME FOR COMPLETE ECG

### 5 stations:

1- Rhythm & rate

2- Axis

3- Lead II

4-VI

5- V6

### N.B.:

- Topography:

II, III, aVF: inferior

V1 - V4: antero-septal

V1 - V6: extensive anterior

V5-V6: Antro-Lateral

- Don't mention the final diagnosis except after observing the 5 stations

- In presence of LBBB → don't diagnose either: - LVH

- antero-septal M.I.

### 1- RHYTHM & RATE

← Using the previous (Rhythm strip) scheme

From the rhythm strip

Or the longest lead in duration

Or any lead if they are the same

وتكتب كده في الورقة

N.B. in the single beat ECG → we can NOT determine Rate or Rhythm

### 2- AXIS:

← From leads I & aVF

Right axis deviation

Left axis deviation

→ Right ventricular hypertrophy

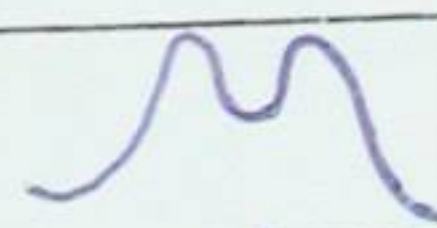
→ Left ventricular hypertrophy

راجع ال So Voltage

### 3- LEAD II

#### P wave:

Broad & bifid



P mitrale

Tall & peaked



P pulmonale

Inverted

Nodal rhythm

Saw tooth

Atrial flutter

Absent

Nodal AF

#### P-R:

- Prolonged: 1AVB

تطول

← لأن Lead II

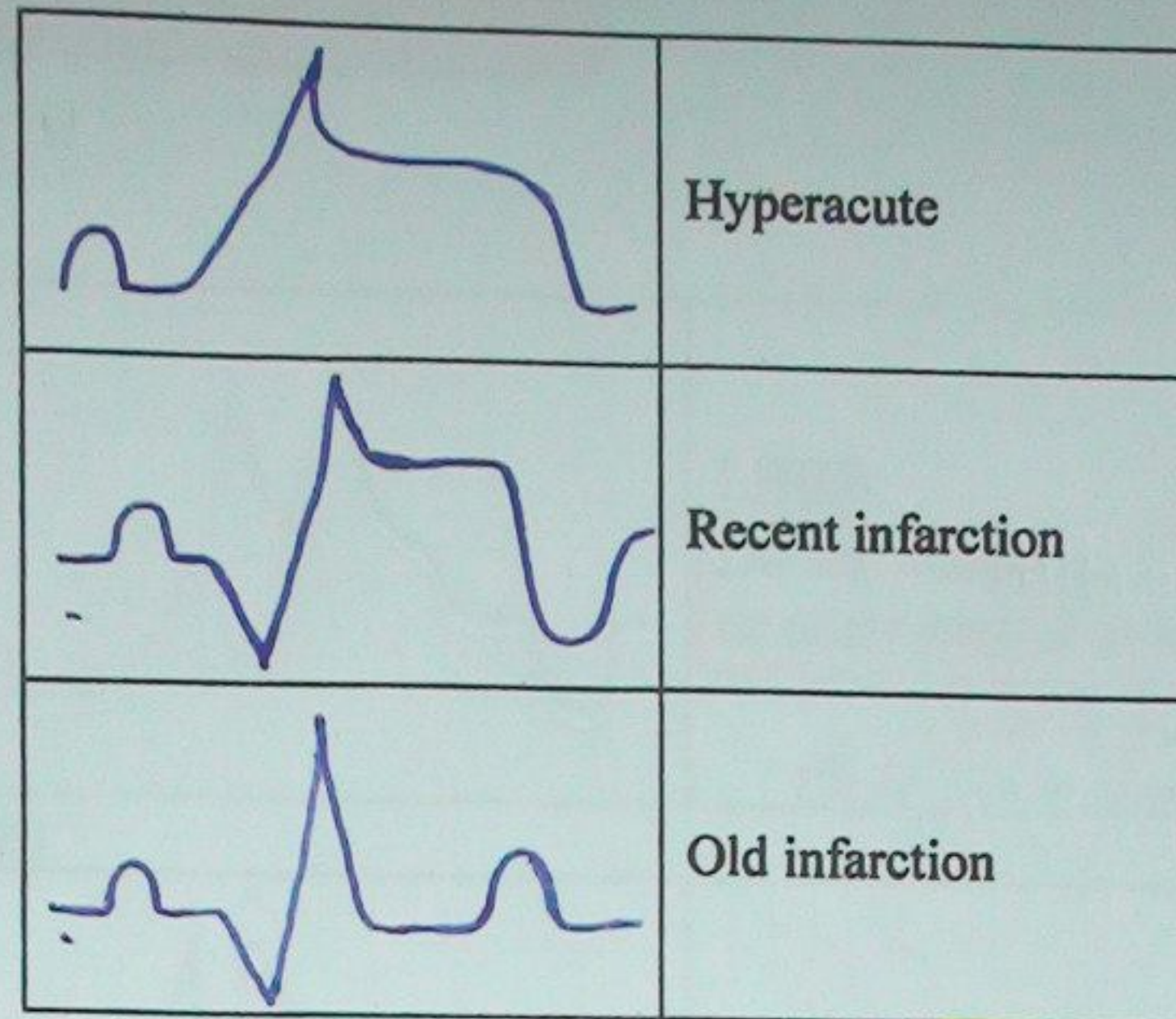
أحالة Lead

أركم به ال P-R

WBW تقص - مش بتقول المفروض



QRS: pathological Q = infarction



Lead II أنت لقيتم فيه  
inferior شكله

شكلاً The same changes will be in lead III and aVF → inferior

ST: depressed } ischemia  
T: inverted } Topography (inferior)

سيكتر

4- VI

QRS:

|              |                                                                                         |
|--------------|-----------------------------------------------------------------------------------------|
|              | RBBB                                                                                    |
| Volt:        |                                                                                         |
|              | Normal                                                                                  |
| Exaggeration | Left ventricular enlargement (LVH)                                                      |
| Inverted     | Right ventricular enlargement (RVH)                                                     |
| زيادة الفولت | Infarction<br>Same changes in:<br>V1 - V4: antero-septal<br>V1 - V6: extensive anterior |

ST: depressed } ischemia  
T: inverted } topography (anteroseptal or extensive anterior)

لازم القدر  
كام ml  
كام Volt

NB  
لازم تلاقي نفس التغييرات  
في V6

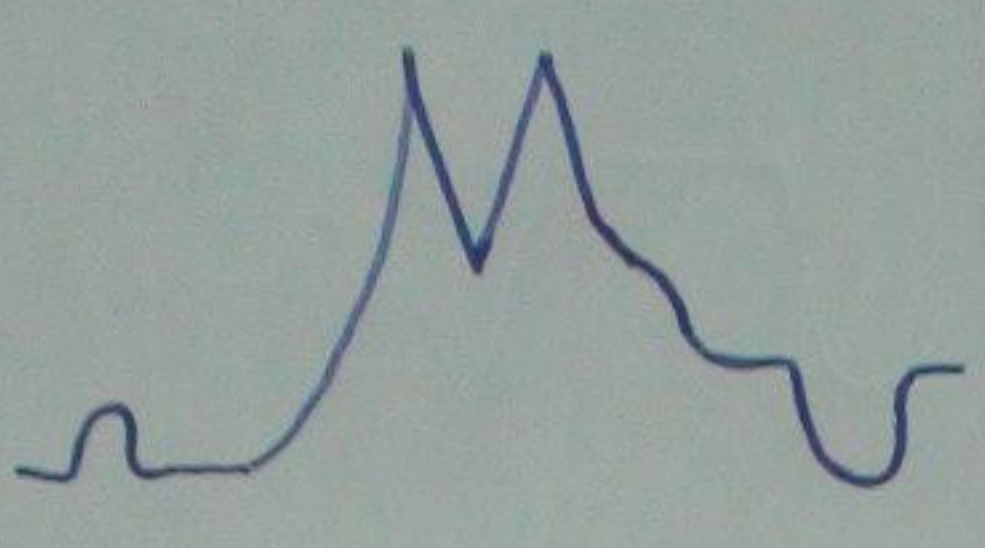
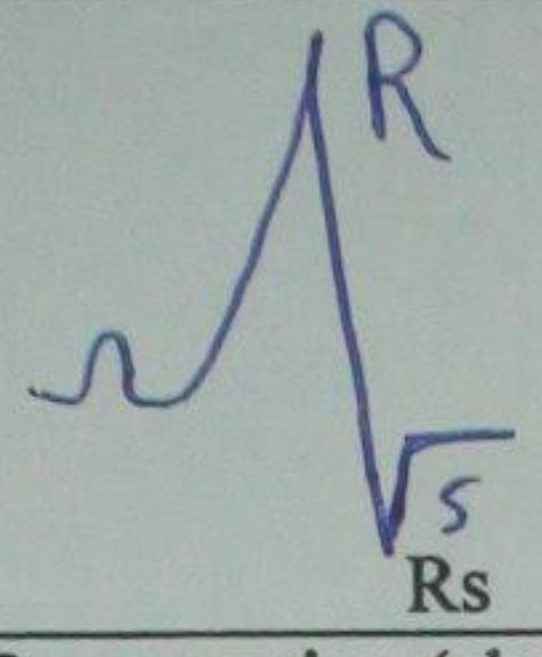
راجع ال Axis  
هتلاقي تغييرات فيه



مكرر

5- V6

QRS:

|                                                                                    |                                                                                                                             |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
|   | <b>LBBB</b><br>Do not diagnose LV enlarge. or anteroseptal infarction<br>إذا كنت تشخص دول (أشعرهم) زي (الفريق) ما يتشكك فيك |
| Volt:                                                                              |                                                                                                                             |
|  | Normal                                                                                                                      |
| Exaggeration (check width)                                                         | - wide → LBBB<br>- narrow → LVH                                                                                             |
| Inverted                                                                           | RVH                                                                                                                         |
| زيه اليه فاني                                                                      | Infarction<br>Same changes in:<br>V1 - V6: extensive anterior<br>V5 - V6: anterolateral                                     |

أحذر القصر العيني  
 بيجيبه في صورة  
 Wide, Monophasic R

لازم الغد

NB: - لازم تلاقي نفس التغييرات في V1

- راجع ال Axis  
 هتلاقي تغييرات فيه

ST: depressed } ischemia  
 T: inverted } topography (extensive anterior, anterolateral)

N.B.: if T wave is inverted in all ECG: pericarditis

